# NURSING UNIT TURNOVER, WORKGROUP PROCESSES, AND UNIT-LEVEL PATIENT OUTCOMES

by

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ABSTRACT

SUNG-HEUI BAE: Nursing Unit Turnover, Workgroup Processes, and Unit-level Patient Outcomes
(Under the direction of Dr. Bruce Fried)

Globally, nursing shortages are critically important to policy makers, healthcare managers, and the nursing community. Persistent shortages and instability in the nursing workforce raise questions about the impact of turnover on nurse morale, effectiveness, cost containment efforts, and the quality of patient care. However, limited research has focused on the impact of nursing turnover on hospital inpatient outcomes. Furthermore, little existing empirical research on turnover consequences focuses on the direct impact of nursing turnover on nurses and patient outcomes, although the general turnover literature suggests underlying mechanisms of the turnover-outcome relationship. Therefore, this study develops and tests a conceptual model incorporating the relationships among nursing turnover, workgroup processes, and patient outcomes, which is formulated around an input-process-outcome (IPO) framework posited by McGrath (1964). Specifically, this study examines how nursing unit turnover affects key workgroup processes (workgroup cohesion, relational coordination, and workgroup learning) and how these processes mediate the turnover-outcome relationship. Additionally, this study assesses positive aspects of nursing turnover through examining a nonlinear relationship between turnover and workgroup learning. This study uses registered nurse and patient data from 268 nursing units at 141 hospitals collected as part of the

Outcomes Research in Nursing Administration II study (grant number 2R01NR03149). The findings support that nursing units with moderate levels of turnover (greater than 3.2% to 4.5%) are likely to have lower levels of workgroup learning compared to nursing units with 0% turnover. This study also found that nursing units with low levels of turnover (greater than 0% to 3.2%) are likely to have fewer patient falls than nursing units with 0% turnover. This suggests that low levels of nursing unit turnover may be beneficial in the prevention of patient falls. Additionally, workgroup cohesion and relational coordination have a positive impact on patient satisfaction, and increased workgroup learning leads to fewer occurrences of medication errors. Further investigation is needed to assess the turnover-outcome relationship as well as the mediating effect of workgroup processes on this relationship. This study provides healthcare managers with information about the underlying mechanisms involved in the turnover-outcome relationship and contributes to a limited body of knowledge on the consequences of nursing turnover. Therefore, the findings of the current investigation provide decision makers with more specific information on the operational impact of turnover so as to better design, fund, and implement appropriate intervention strategies to prevent RN exit from hospital nursing units.

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# Chapter 1

# INTRODUCTION

## Background and Significance

Appropriate staffing of health systems around the world is under increasing stress due in large part to economic and demographic pressures. Globally, the nursing workforce crisis shows no signs of abating, and continued nursing shortages have important implications for health care policy makers and managers (Joint Commission, 2002; O'Brien-Pallas et al., 2006). As nursing shortages grow and the need increases for enhanced recruitment and retention strategies, dysfunctional aspects of nursing turnover have been an implicit theme in studies of nursing turnover, and numerous studies from several disciplines have been undertaken to better understand turnover behavior. While the prime focus of turnover research has been to elaborate the antecedents of turnover, few studies focus specifically on the consequences of turnover (Glebbeek & Bax, 2004). Much has been written about the factors affecting employee turnover, but little has been published about its impact on organizational performance. This imbalanced focus among the general turnover studies also appears in the nursing turnover literature (Hayes et al., 2006; Tai, Bame, & Robinson, 1998). This paper addresses the consequences of nursing turnover rather than the antecedents of turnover.

**Nurse Turnover**

Hospital nursing has for many years been characterized by high turnover (Tai et al., 1998). Studies have suggested several reasons for turnover, including lack of respect, poor upward mobility, availability of work opportunities outside of the hospital setting, and stress and burnout (Hayes et al., 2006). The estimated national annual turnover rate in 1980 was thirty percent (National Association for Health care Recruitment, as cited in Tai et al., 1998). The national turnover rate among nurses working in hospitals was 26.2 % in 1998 (Janet Heinrich, as cited in Stechmiller, 2002). By 2000, a national survey reported a 21.3 % average turnover rate for registered nurses (RNs) in 693 different acute care hospitals (American Organization of Nurse Executives [AONE] commissioned survey; The HSM group, 2002). Most of the hospitals in this survey reported annual turnover rates between 10% and 30%. Current nursing workforce instability generates high economic costs and potentially has an adverse effect on the quality of care and patient outcomes (Hayes et al., 2006; Tai et al., 1998). Furthermore, researchers expect these issues to become more acute as the aging baby boomers' demands for health care services increase (Joint Commission, 2002). Regarding this issue, Buerhaus and colleagues (2000a) indicated that baby boomers in their old age, all 78 million of them, would have access to scientific advances and technologies that help them live longer. Given this anticipated additional demand for health care services, they estimated that there would be at least 400,000 fewer nurses available than will be needed to provide care by the year 2020.

In addition, under the condition of nursing shortage, which is already having a great impact on patient safety and the continuity and quality of care, the impact of nursing turnover on patient care may be far more severe due to higher levels of vacancies. At the same time,

increased nursing turnover without newcomers is detrimental to nursing workforce stability. The shortage of registered nurses is already having ill effects on the U.S. health care delivery system (Stechmiller, 2002). Fifty-seven percent of US hospitals reported that critical care nursing positions were the most difficult of nursing positions to fill (Buerhaus, Staiger, & Auerbach, 2000b). In the 2006 national survey of registered nurses, more than nine in ten RNs (93%) perceived the national supply of nurses to be less than the demand, which is a noticeable increase from 2004 when only 73% of RNs perceived a nursing shortage (Buerhaus et al., 2007a). Furthermore, 126,000 nursing positions are currently unfilled in hospitals across the country (American Hospital Association, as cited in Joint Commission, 2002). The 2006 national survey of registered nurses found registered nurses, chief executive officers, and chief nursing officers responding that the major effects of the nursing shortage have been in the areas of communication, nurse-patient relationships, hospital capacity, and quality of care (Buerhaus, et al, 2007b). As such ongoing instability in the nursing workforce grows, the adverse impacts of nursing turnover on a healthcare organization's capacity to meet patient needs and to provide quality care become more serious (Tai et al., 1998). Thus, investigating the impact of turnover on patient safety, nurse satisfaction, and the continuity and quality of patient care becomes necessary.

Different approaches have been used to estimate the costs associated with nursing turnover, but the results are not uniform. Recent studies have reported the costs of nurse turnover ranging from approximately $22,000 to over $64,000 (U.S.) per nurse turnover (Jones, 2005; OBrien-Pallas et al., 2006; Waldman et al., 2004). The indirect costs of nurse turnover, however, are thought to be particularly significant because of the combined effects of the initial decline of productivity due to a new employee, a decrease in staff morale, and

decreased group productivity, all of which are caused by turnover (Johnson & Buelow, 2003; Jones, 2008). Some renewal of staff may have short term economic benefits, such as opportunities for cost reduction with decreased salaries, benefit costs, and vacation pay (Jones, 1990), but research has suggested that, as turnover reaches 50%, the net effect on productivity is probably negative (Price & Mueller, 1981).

A well-developed body of literature examines the factors affecting nursing turnover (Hayes, 2006; Tai et al., 1998). Among the factors associated with nurse turnover, job dissatisfaction and expressed intent to leave are most consistently reported as impacting turnover. Job satisfaction, turnover intention, and turnover behavior also appear to be influenced by organizational characteristics, socio-demographic characteristics of the nurses, and economic factors for nurses (Hinshaw & Atwood, 1985). Individual factors associated with turnover were identified in a review study by Tai et al. (1998) and include anticipated turnover for younger nurses (Shader, Broome, Broome, West, & Nash, 2001), kinship responsibilities possibly requiring a change in work environment (Cavanagh, 1989), career advancement prompted by a nurse's furthered education (Tai et al., 1998), and greater satisfaction of employees with longer tenure (Hayes et al., 2006; Price & Mueller, 1981). Organizational factors that contribute to turnover behavior include workload, stress, and burnout (Strachota, Normandin, O'Brien, Clary, & Krukow, 2003; Tai et al., 1998), a participative management style (Jones, Stasiowski, Simons, Boyd, & Lucas, 1993; Yeatts & Seward, 2000; Leveck & Jones, 1996), empowerment and autonomy (Hayes et al., 2006), promotional opportunities (Hayes et al., 2006) , and work schedules (Hung, 2002; Kane, 1999). Researchers suggest that modifying the work environment to improve quality of work life may help to reduce nurse turnover (Alexander, 1988).

**Effect of Nurse Turnover on Patient Outcomes**

The loss and disruption of organizational processes is a major consequence of turnover, which can reduce both the effectiveness and productivity of care delivery while increasing the overall labor costs of operating the facility (Cavanagh, 1989; Price & Mueller, 1986; Tai et al., 1998). Important theoretical literature describes the mechanisms by which turnover may lead to negative outcomes. As turnover increases, the remaining staff must constantly adjust to newcomers, and turnover may affect the interactions and integration among those who remain in the organization (Price, 1977). The instability caused by turnover may produce poor work-unit cohesiveness, demoralization, communication breakdowns, and fragmented coordination (Cavanagh, 1989; Mobley, 1982; Price, 1977; Staw, 1980). Through these mechanisms, turnover is likely to affect quality of care.

Although the adverse consequences of turnover have long been a major concern in turnover studies, researchers have also suggested positive aspects of low levels of turnover (Dalton & Todor, 1979; Price, 1977; Staw, 1980). For example, Dalton and Tudor (1979) suggested that turnover at moderate levels infuses "new blood," introducing fresh ideas and keeping the organization from becoming stagnant. Also, employee mobility is important for the development of innovation by permitting organizations to become more flexible and adaptable to change (Pfeffer, 1979). In a similar vein, Staw (1980) suggested that an organization can use turnover as a constant source of input to help keep organizational beliefs and information congruent with outside changes.

As noted earlier, few studies have focused on the impact of nurse turnover on nurse and patient outcomes. Those studies that address this issue have focused on the direct impact of turnover on patient care. For instance, the Voluntary Hospital Association (2002) found a

negative relationship between employee turnover and average length of stay. In a more recent study of the impact of nursing turnover on the continuity of care, turnover was shown to affect negatively a number of important treatment and follow-up activities (Minore, Boone, Katt, Kinch, Birch, & Mushquash, 2005). In addition, some empirical research tested positive aspects of nursing turnover on patient care (Alexander, Bloom, & Nuchols 1994; Castle & Engberg, 2005) and found little evidence to support a positive impact of turnover on patient outcomes. Before making a conclusion about turnover's impact, further investigation clearly is needed.

## Research Problems

Little existing empirical research on turnover consequences focuses on the direct impact of nursing turnover on nurses and patient outcomes, although general turnover literature suggests underlying mechanisms of the turnover-outcome relationship. Thus, there is a need to understand not only the overall effect of turnover on outcomes but also on the underlying reasons for these effects. In this way, the impact of turnover on quality may be mitigated through interventions that limit destructive effects on key organizational processes. In this study, we hypothesize that turnover may affect outcomes because of its impact on underlying organizational processes, such as workgroup cohesion and communication. To examine the underlying mechanisms between nursing turnover and healthcare outcomes, we need to consider the workgroup as the unit of analysis because the nursing unit represents a proximal context for individuals and a bounded interactive context created by their attributes, interactions, and responses (Kozlowski, Steve, & Bell, 2003).

Previous studies of turnover have for the most part examined the impact of healthcare organizational level turnover on patient and institutional outcomes (Alexander et al., 1994; Castle & Engberg, 2005; Voluntary Hospital Association Health Foundation, 2002; Zimmerman, Gruber-Baldini, Hebel, Sloane, & Magaziner, 2002). Although the results of these studies may not be comparable with each other due to different study settings, an adverse relationship between nursing turnover and quality of patient care has been seen across the research, implying that higher nursing turnover is detrimental to an organization's capacity to meet patient needs and provide quality of care. Studies using the turnover rate aggregated at the hospital level, however, do not consider intra-organizational variations in turnover and team processes at less aggregated levels, particularly across nursing units within a hospital; thus, these studies are not sensitive to variations in a single organization, and their conclusions may be misleading. In the current study, taking the nursing unit as the unit of analysis allows us to investigate how turnover affects workgroup processes, and how these processes in turn affect patient care. Examining turnover at the level of the nursing unit may also have the benefit of accounting for positive aspects of nursing turnover, such as workgroup learning. Understanding the relationship among nursing unit turnover, workgroup processes, and patient outcomes will help us better understand the association between nursing turnover and patient outcomes.

The purpose of the dissertation is to develop and to test a conceptual model incorporating the relationships among nursing turnover, workgroup processes, and patient outcomes. The specific questions to be answered are as follows:

1. How does nursing unit turnover affect key workgroup processes?

2. How do workgroup processes in turn mediate the impact of nursing unit turnover on patient outcomes?

## Definitions

As with any study, this dissertation is guided by major constructs that must be thoroughly defined. Those key concepts are "nursing unit turnover," "workgroup processes," and "patient outcomes."

### Nursing Unit Turnover

Price (1977) defined turnover as individual movement into and out of an organization or certain workgroups. The individuals involved are employees, and the movement can be either into (accessions) or out of (separations) the organization (Fitz-enz & Davision, 2002). This study focuses on separations of individual members of a nursing unit. This definition encompasses voluntary and involuntary turnover, as well as internal and external turnover. Turnover initiated by an individual is voluntary turnover. "Quits" is probably a representative example for voluntary turnover. Involuntary turnover is movement not initiated by the individual, such as dismissals, layoff, most retirements, and deaths (McConnell, 1999). In organizational turnover, internal turnover (e.g., transfers and promotions) are not considered because they do not involve movement across the membership boundary of the organization (Fitz-enz & Davision, 2002). However, this study includes both internal and external turnover because, in the nursing units, internal (e.g., transfer) and external turnover has an essentially identical effect on unit dynamics regardless of whether a nurse leaves the nursing unit or the hospital. Therefore, the current study

defines nursing unit turnover as the nursing staff's separation from nursing units both voluntary and involuntary, as well as internal and external turnover.

**Workgroup Processes**

Workgroup processes represent mechanisms that inhibit or enable the ability of team members to combine their capabilities and behavior. Workgroup processes are presented as dynamic in nature, consisting of action and reaction in the form of communication and activity (Kozlowski, Steve, & Bell, 2003). Marks et al. (2001) defined team processes as team members' interdependent acts that transform inputs to outcomes by cognitive, verbal, and behavioral activities to achieve collective goals. Kozlowski et al. (2003) classified workgroup processes as affective-motivational, behavioral, and cognitive mechanisms. In this study, workgroup cohesion, relational coordination, and workgroup learning are treated as the three aspects of workgroup processes that link nursing turnover to patient outcomes. As an affective-motivational process, workgroup cohesion is defined as the result of all the forces acting on the member to remain in the group (Festinger et al., 1950). Gittell (2000) introduced a spontaneous form of coordination characterized by frequent, timely, and accurate problem-solving communication, as well as shared goals, knowledge and mutual respect among workers. In addition, workgroup learning refers to relatively permanent changes in the knowledge of an interdependent set of individuals, associated with experience, and can be distinguished conceptually from individual learning (Kozlowski et al., 2003). According to the general turnover literature, turnover is detrimental to workgroup processes in the form of demoralization, fragmented coordination, communication breakdown, and workgroup memory loss (Staw, 1998; Price, 1997). These workgroup processes have been

studied in healthcare settings and appear to be associated with better patient outcomes (Shortell et al., 1994; Meterko, Mohr, & Young, 2004). In this study, workgroup processes are conceived as a mediator. This approach could increase our understanding of the mechanisms through which turnover influences outcomes. A further explanation about the mediator will be presented with the conceptual framework of this study in Chapter 2.

**Unit-level Patient Outcomes**

This study examines how nursing turnover affects workgroup processes and how workgroup processes mediate the nursing turnover-patient outcome relationship. In the current study, the measured outcomes are patient satisfaction, average length of patient stay, patient falls, and medication errors.

*Patient satisfaction* is defined as the degree of convergence between the patients' expectations of ideal care and their perceptions of the care they really receive (Risser, 1975). Patient satisfaction is used in the current study to capture specifically patients' satisfaction with the nursing care that they receive on the particular unit. Because patients receive care from multiple nurses during any particular hospital stay, however, patient satisfaction cannot be easily attributed to a specific nurse; therefore, patient satisfaction is operationalized in the current study as a unit-level patient outcome measure.

*Average Length of Patient Stay* is the duration of a single episode of hospitalization. In the National Health Interview Survey (National Health Interview Survey, 2007), average length of stay in a hospital per discharged inpatient is computed by dividing the total number of hospital days for a specified group by the total number of discharges for that group. The current study uses average length of patient stay in a nursing unit as a specified group.

*Patient Falls* are defined as troublesome events that result in patients' coming to rest unintentionally on the ground or other lower surface (Morris & Isaacs, 1980).

*Medication Errors* are any preventable events that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer (National Coordinating Council for Medication Error Reporting and Prevention, 2007). Medication errors may result from prescribing mistakes, failed monitoring, patient noncompliance, dispensing errors, and administration errors (Wakefield et al, 1996). In this study, medication errors are treated as an end-result of nursing unit turnover; thus, this study focuses on medication errors associated with nursing care. Therefore, medication errors are defined as errors related to the wrong dose, wrong patient, wrong time, wrong drug, wrong route, or an error of omission. In addition, due to under-reporting bias, medication errors resulting in severe cases are of primary interest.

## Dissertation Organization

The dissertation is organized as follows. In Chapter 2, a literature review on nursing turnover focuses on the three most frequently investigated topics: definitions, determinants, and consequences of nursing turnover. In the second section of Chapter 2, based on the premises of both the consequences of nursing turnover on workgroup processes and patient outcomes, a new integrated theoretical framework is suggested, and hypotheses are proposed. Chapters 3 and 4 describe the methodology and results of the study, respectively. Finally, Chapter 5 presents a discussion and conclusion drawn from the results of the study.

# Chapter 2

# LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This chapter reviews the literature on nursing turnover and develops a conceptual framework for examining the effects of nursing turnover on patient care. The first section of the chapter comprises three sub-sections according to the topics that are most commonly considered in the turnover literature: 1) turnover definitions, 2) the determinants of nursing turnover, and 3) the consequences of nursing turnover. The second section develops a hypothesized conceptual framework examining the impact of nursing turnover on workgroup processes and patient outcomes by incorporating the constructs derived from turnover theories and the input-process-output (IPO) framework.

## Literature Review on Turnover Studies

### Turnover Definitions

Turnover is defined as movement of employees into and out of organizations or certain workgroups (Fitz-enz & Davison, 2002; Price, 1977). The U.S. Bureau of Labor Statistics uses these terms (accessions and separations) to describe movements across organizational boundaries (Fitz-enz & Davison, 2002). In this study, separations of nursing staff are of primary interest. Newly-hired employees are a common source of accessions. Retirement, layoffs, dismissals, and deaths are examples of separation. Turnover initiated by an individual is voluntary turnover. "Quits," such as leaving for other employment, leaving for "personal" reasons, and retirement are the most frequent causes of voluntary turnover.

Involuntary turnover is movement not initiated by the individual, such as dismissal, layoff, and illness or death (McConnell, 1999).

Both the definition of turnover and how it is measured are often inconsistent, complicating comparisons or generalizations across studies (Tai et al., 1998). Although different conceptualizations and measurements have been used in turnover studies (e.g., quitters vs. non-quitters; leavers vs. stayers; new staff vs. old staff; intention to quit vs. intention to stay; and vacant positions vs. positions already filled) (Tai et al., 1998), most research on turnover examines separations. Because quitting is the most common type of separation and because organizations can often control this type of turnover, turnover research on separations has focused on quitting (Price & Mueller, 1986).

In addition to defining actual turnover, turnover studies sometimes use a proxy measure of actual turnover, such as intention to leave, and such studies have shown intention to leave as an immediate determinant of actual turnover. This turnover measure is essentially synonymous with anticipated turnover, intention to quit, turnover intent, propensity to leave, and intention to resign (Table 1). Although the measures used vary across studies, studies tend to use one of these measures to assess nurses' intentions to leave.

Nursing turnover describes a process of behavior within a health care organization whereby nurses leave the organization or transfer and become employed in other units of the organization (Jones, 1990; Price & Mueller, 1986). This definition encompasses voluntary and involuntary turnover as well as internal and external turnover. Voluntary and involuntary turnover are not always differentiated in studies because costs caused by newly–hired members are incurred regardless of whether staff resign or are requested to leave. Similarly, transfers and promotions, which are forms of internal movement, are viewed

Table 1. Selected Studies of Nursing Turnover Determinants

| Author(s) | Purpose | Turnover | Sample/Setting | Findings |
|---|---|---|---|---|
| Alexander (1988) | Assess organizational and administrative conditions specific to the hospital patient care unit as important determinants of nursing turnover in hospitals | Actual turnover | 1,726 registered nurses in 146 units within the 17 hospitals | Salience of evaluation, communication and coordination, and structural characteristics facilitating organizational integration appear to be important in predicting turnover rates. Centralization of authority was found to have little effect on turnover rate. |
| Collins et al. (2000) | Examine the view of nurses and professionals allied to medicine in innovative roles, on job satisfaction, career development, intention to leave and factors that hinder and enhance effective working | Intention to leave | 452 nurses and 162 professionals allied to medicine | High level of job satisfaction in both groups. Job satisfaction was significantly related to feeling integrated within the post-holder's own professional group and with immediate colleagues, feeling that the role had improved their career prospects, feeling adequately prepared and trained for the role, and working to protocol. Low job satisfaction was significantly related to intention to leave the profession. |
| Davidson et al. (2000) | Examine the effects of change in hospital environment on nurses' job satisfaction and voluntary turnover | Voluntary turnover, intent to leave | 736 hospital nurses in one hospital | Determinants of low satisfaction were poor instrumental communication and great a workload. Intent to leave was predicted by the perception of little promotional opportunity, high routinization, low decision latitude, and poor communication. Predictors of turnover were fewer years on the job, expressed intent to leave, and not enough time to do the job well. |
| Hinshaw et al (1987) | Evaluate a innovative retention strategy | Anticipated turnover and actual turnover | 1,597 nursing staff from seven urban and eight rural hospitals | Job stress is buffered by satisfaction that in turn leads to less anticipated turnover. The major stressors to be buffered were lack of team respect and feelings of incompetence while primary satisfiers were professional status and general enjoyment in one's position. |
| Jones et al. (1993) | Evaluate the impact of shared governance at a large regional teaching hospital on staff nurse perceptions of management style, group cohesion, job stress, job satisfaction, and anticipated turnover | Anticipated turnover | About 200 nurses from a 611-bed regional teaching hospital | Shared governance significantly improved nurses' perception of management style, organizational job satisfaction, and professional job satisfaction, and reduced anticipated turnover scores. |

| Author(s) | Purpose | Turnover | Sample/Setting | Findings |
|---|---|---|---|---|
| Kane (1999) | Compare the job satisfaction, burnout and propensity to leave one's job for nurses employed in full-time, part-time and job sharing positions | Propensity to leave | 269 nurses drawn from a large Canadian teaching and referral hospital | Job sharing has a positive impact on job satisfaction and job retention. |
| Leveck and Jones (1996) | Examine effects of key factors in the nursing practice environment on staff nurses retention and process aspects of quality of care | Staff retention | 358 nurses from 50 nursing units | Experience on the unit and professional job satisfaction were predictors of staff nurse retention; job stress and clinical service were predictors of quality of care. |
| Lum et al. (1998) | Assess both the direct and indirect impact of certain pay policies upon the turnover intentions of pediatric nurses | Intentions toward turnover | 361 full- and part-time registered staff nurses at the selected hospital | Job satisfaction has only an indirect influence on the intention to quit. Organizational commitment has the strongest and most direct impact. Pay satisfaction had both direct and indirect effects on turnover intent. Having a degree, children, and working 12-hour shifts have direct and indirect influences on pay satisfaction and turnover intent. |
| Parasuraman (1989) | Test an integrated model of turnover incorporating personal, organizational, and job experience variables, job attitudes and behavioral intentions as predictors voluntary turnover among staff nurses | Voluntary turnover | 307 nurses employed full time in a large metropolitan hospital | Intention to leave was the most immediate determinant of actual turnover. Personal, organizational, and job experience variables were found to influence voluntary turnover only indirectly through their effects on three attitudinal variables: felt stress, job satisfaction and organizational commitment, and intention to leave. |
| Price and Mueller (1981) | Estimate a causal model of turnover | Intent to stay and turnover | 1,091 registered nurses in seven hospitals | Total effects on turnover were found to be the greatest for four determinants: intent to stay, opportunity, general training, and job satisfaction. |
| Shader et al. (2001) | Examine the relationships between work satisfaction, stress, age, cohesion, work schedule, and turnover | Anticipated turnover and actual turnover | 241 nurses from 12 units in a 908-bed hospital | Job stress, group cohesion, work satisfaction, and weekend overtime were predictors of anticipated turnover. There were differences in the factors predicting anticipated turnover for different age groups. |
| Strachota et al. (2003) | Determine reasons that registered nurses voluntarily left their nursing positions and changed their employment status | Voluntary termination | 84 hospital nurses | Reasons for change were staffing levels, management support, hours worked, heavy workload, poor quality of care, unsafe patient care practices, relationship with co-workers, physicians, and other department, returning to school, and family responsibilities. |

as turnover because the impact of a nurse's departure is incurred regardless of whether he or she leaves the nursing unit or the hospital. Thus, this study defines nursing unit turnover as separations of nursing staff at the nursing unit (both internal and external).

**Determinants of Nursing Turnover**

Numerous studies have been conducted to understand the factors affecting turnover behavior (Hayes et al., 2006). Models of nursing turnover have characterized turnover as a function of job satisfaction which is influenced by variables that include organizational factors, demographics, environmental conditions, and professional and personal issues (Hinshaw & Atwood, 1983; Irvine & Evans, 1995; Price & Mueller, 1981). Much of the research explores how turnover behavior is influenced by organizational characteristics associated with workload, management style, empowerment and autonomy, promotional opportunities and work schedules (Hayes et al., 2006).

A consistently heavy workload tends to be associated with decreased job satisfaction, which in turn may increase the likelihood of turnover (Leveck & Jones, 1996; Strachota et al., 2003; Leveck & Jones, 1996). Aiken et al. (2002) found that each additional patient per nurse is associated with a 23 % increase in the odds of burnout and a 15% increase in the odds of job dissatisfaction. Some research has found that work-related stress is associated with working in specific types of units, such as oncology (Barrett & Yates, 2002) or psychiatry (Cameron, Horsburgh, & Armstrong-Strassen, 1994). Certain types of work schedules including long shifts, overtime, weekends, nights, holidays and weekend overtime have been found to be predictors of anticipated turnover (Shader et al., 2001). Self-scheduling strategies are beneficial to promote balance between work and home, especially for nurses

who have home responsibilities (Hung, 2002; Kane, 1999). Furthermore, leadership that values staff contributions promotes retention (Bratt et al., 2000; Leveck & Jones, 1996), and a participative management style enhances job satisfaction (Jones et al., 1993; Yeatts & Seward, 2000). Studies have demonstrated that empowerment is associated with job satisfaction; however, a direct link with nursing turnover has not been determined (Hayes et al., 2006). Career development and life-long learning activities in nursing promote job satisfaction and increased retention of nurses (Collins et al., 2000; Davidson et al., 1997; Donner & Wheeler, 2001).

Research indicates that certain socio-demographic characteristics (age, race, income, tenure, and job categories of nurse staff) increase turnover risk; however, causal models of nursing turnover do not usually consider them to be explanatory variables (Price & Mueller, 1981; Tai et al., 1998). Studies suggest an inverse relationship between age and turnover (Parasuraman, 1989) – anticipated turnover for younger nurses to be associated with job satisfaction and stress (Shader et al., 2001). Kinship responsibilities involve home obligations, and children, spouses, and aging parents have been shown to affect the work and turnover habits of nurses (Cavanagh, 1989). Minority employees may be less likely to change jobs than whites because of less job mobility or fewer opportunities (Tai et al., 1998). Education level is believed to impact turnover inasmuch as individuals with more education are more likely to quit to advance their careers if their current organization has limited opportunities (Tai et al., 1998). In terms of work experience, nurses with more experience are more satisfied with pay and less likely to leave, while less experienced nurses tend to be younger, to participate less in decision-making, and to have fewer home responsibilities (Hayes et al., 2006; Price & Mueller, 1981)

More affluent individuals may have less need or motivation to change jobs to improve their incomes (Tai et al., 1998). Price and Mueller (1986) found a significant inverse relationship between turnover and both family and individual incomes. Lum et al. (1998) found that satisfaction with pay correlates strongly with reduced turnover intent. Other research suggests that satisfaction with pay does not have a strong impact on turnover (Irvine & Evans, 1995), that pay is not a high priority (Frisina, Murray, & Aird, 1988), and that pay is not associated with turnover (Mobley, Griffeth, Hand, & Meglino, 1979).

In summary, job dissatisfaction and expressed intent to leave are most consistently reported as impacting nursing turnover. Job satisfaction and turnover intention are also influenced by organizational characteristics associated with workload, management style, empowerment and autonomy, promotional opportunities and work schedules. Researchers suggest that modifying the work environment to improve quality of work life is crucial to reducing the incidents of nurse turnover. While socio-demographic characteristics are not usually considered explanatory in a turnover model, other factors, such as younger age, shorter tenure, higher level of education, and kinship responsibilities, are reported as related to turnover. Regarding to economic factors, the impact of compensation on turnover is inconsistent across studies. Table 1 summarizes selected studies of nursing turnover determinants.

## Consequences of Nursing Turnover

### *Turnover Costs*

Studies have measured and defined turnover in a variety of ways, complicating any firm conclusions about the financial costs of turnover. For example, replacement cost

estimates vary for a number of reasons, such as departments and components included in the measure. Direct costs such as advertising, recruiting, agency nurses, and hiring occur during the hiring process (Hayes et al., 2006). Indirect costs of turnover are due to RN termination, orientation, training, and decreased RN productivity, which is thought to be significant because of the combined effect of a new employee's initially decreased productivity and a decrease in staff morale and workgroup productivity (Johnson & Buelow, 2003; Jones, 1990). The indirect costs of turnover also include increasing patient length of stay, inefficient discharge planning, inconsistent use of polices and procedures, communication problems, errors, and nurse fatigue and burnout (Jones, 2008).

Recent studies of the costs of nurse turnover have reported results ranging from about $22,000 to over $64,000 (U.S.) per nurse turnover (Jones, 2005; OBrien-Pallas et al., 2006; Waldman et al., 2004). Waldman (2004) indicates that models of turnover costs have typically omitted the costs associated with the lower productivity of new hires, which requires calculations using learning curve algorithms. In his application of rigorous accounting methodology, he found that the total cost for a newly hired nurse averaged $15,825 and that the cost of reduced productivity ranged from $5,245 to $16,102 by using learning curve algorithms and retention rate methodologies. The Advisory Board Company (2000) suggests that the visible or direct hiring costs are approximately 21% of salary, while the hidden costs of lost productivity are 79% of salary. In a similar vein, O'Brien-Pallas et al. (2006) found that direct costs normally incurred in the employment function are $6,445 per nurse and $15,069 for indirect costs as a result of both the time spent administering the turnover process and the costs associated with the orientation, training, and lower productivity of new employees. On the other hand, Jones (2005) estimated turnover costs

much higher than estimates from other studies. She reported that per RN turnover cost ranged from approximately $62,100 to $67,100, and the total nurse turnover cost raged from approximately $5.9 million to $6.4 million. Four cost categories, including vacancy, orientation and training, newly hired RN productivity, and advertising and recruiting costs, accounted for more than 90% of the total and per RN costs of turnover. The per RN turnover costs determined in her study were greater than the most recent estimate of nurse turnover costs due to the inclusion of detailed vacancy costs. Similarly, Strachota et al. (2003) cite estimates from The Advisory Board Company (2000) of $42,000 to replace a medical-surgical nurse and $64,000 for a specialty nurse. These figures include the costs of recruitment, orientation, precepting and lost productivity. The reasons for this variability can be resulted from conceptual differences, such as defining nurse turnover cost categories, as well as methodological differences, such as study designs and samples (Jones & Gates, 2007).

### *Theories of Turnover Consequences*

While researchers have increasingly paid attention to the impact of inadequate nurse staffing and poor work environments on nurse and patient outcomes, few studies focus specifically on turnover to determine its effect on nurse and patient outcomes. This section includes a theory of turnover developed from research that has examined both positive and negative consequences of turnover.

#### *Adverse Consequences*

Turnover may be stressful for the remaining staff who must adjust to the departure of nurses and the arrival of newcomers (Mobley, 1982). Price (1977) contends that turnover

reduces consensus, increases conflicts, and reduces satisfaction among those who remain with the organization. These factors can affect group cohesiveness, performance, and morale (Cavanagh, 1989). The effects of lower morale can be particularly detrimental to the stayers. Staw (1980) claimed that turnover may stimulate further employee turnover. When viewing staff turnover, remaining employees in the workgroup may see their own fates as less desirable, and they may question their own motivations for staying. Turnover provides salient cues about the organization and the role of members in the organization. Employees who had no previous intent to find new work may consider leaving due to the increased stress of work and the decreased morale as a result of a coworker's departure. Jones (2004) also described this phenomenon of nurses turnover in which turnover begets turnover. In other words, nurses may leave because of the departure of colleagues or disruption of the group. For this reason, turnover may adversely impact interaction and integration among stayers (Price, 1977). As turnover increases, close and continuing social relationships or integration at work become more difficult.

The loss of valued individuals disrupts communication patterns and the social order of the organization (Price, 1977). Newcomer RNs are confronted by an ambiguous social and work context. At the early stages of employment, they are still learning the nature of these communication patterns. Thus, at high levels of turnover, communication is likely to become less accurate (Bluedorn, 1982). Mueller and Price (1989) also found that turnover has a negative influence on instrumental communication in organization. Turnover may affect nurses' ability to do their work because the interdependence of work roles within the organization requires consistent and accurate communication (Staw, 1980). Organizational maintenance structures that focus on ensuring stability or predictability in exchange

relationships are built on a common set of norms, and these structures are jeopardized by turnover (Alexander et al., 1994). At very high rates of turnover, counteracting such disruption through the organization's maintenance mechanisms becomes increasingly difficult (Katz & Kahn, 1978; Staw, 1980). High turnover, therefore, threatens productivity and efficiency.

Nurses who enter into new employment or temporary employment with a hospital require not only job-specific skills and knowledge but also an understanding of organizational procedures (Alexander et al., 1994). This training is particularly important because nursing practice is commonly conducted in workgroups. Although a newcomer can start nursing care without training, considerable time is required to reach an optimal collective level of workgroup functioning with new staff members. Such team-specific knowledge or skills are known as team learning, which refers to relatively permanent changes in the knowledge base of an interdependent set of individuals (Kozlowski et al., 2003). Group learning is highly influenced by time and experience and is thus distinguished conceptually from individual learning. As an example, Argote et al. (1995) examined the effects of turnover on group learning in a laboratory and reported the existence of a group learning curve. The performance of groups making origami birds increased significantly over six periods, with the performance improvements occurring at a decreasing rate. This study found that turnover was detrimental to performance and that the differences between turnover and no-turnover groups were amplified as groups gained experience over time. Thus, nursing unit turnover may limit a work unit's cognitive processes.

*Positive Consequences*

Although much turnover research focuses on the negative consequences of turnover, some researchers have recognized and explored the positive impacts of turnover on both individuals and organizations (Abelson & Baysinger, 1984; Pfeffer, 1976; Staw, 1980). One important positive consequence of turnover is that it provides an opportunity for the organization to adapt to its environment. Pfeffer (1976) contends that turnover can increase the effectiveness of an organization and that employee mobility is important for the development of innovation by permitting organizations to become more flexible and amenable to change. Because almost every other process within organizations promotes homogeneity through rules, normative sanctions, filtering of information, and exposure to a common set of experiences (Staw, 1980), turnover and the resulting inflow of new workgroup members may be a primary source of variety (Campbell, 1965). An organization can use turnover as a constant source of input from the environment to help learn from its environment as it becomes aware of environmental changes (Staw, 1980). Thus, movement of personnel, which involves the transfer of information and access to the environment, may increase the adaptability and flexibility of the organization.

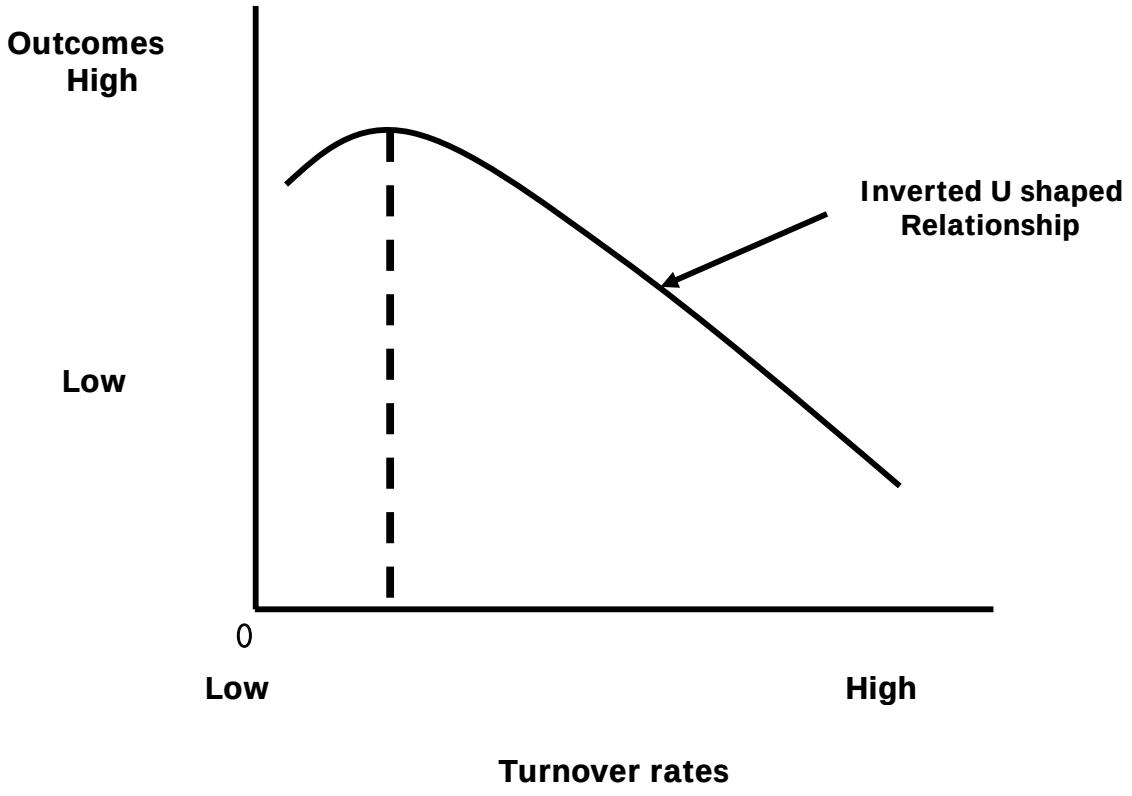
Literature on organizational learning suggests the possibility for positive impacts of turnover. Organizational learning is defined as the growing insight and successful restructuring of organizational problems by individuals as reflected in the structural elements and outcomes of the organization itself (Fiol & Lyles, 1985). Four contextual factors affect the probability that learning will occur in an organization: a corporate culture conducive to learning, a strategy that allows flexibility, an organizational structure that allows both innovativeness and new insights, and a supportive environment. If either the internal or

external environment is too complex and dynamic for the organization, overload may occur, and learning will be compromised (Lawrence & Dyer, 1983). Hedberg (1981) suggests that learning requires both change and stability. Although too much stability and unchanging behavior can lead to stagnation rather than cognitive growth, excessive change may prove to be overwhelming for organizational members. The process of learning involves creation and manipulation of the tension between constancy and change; in fact, a certain amount of stress is necessary for learning to occur (Cangelosi & Dill, 1965). Therefore, nursing turnover may provide certain levels of stress possibly promoting organizational learning.

Another argument supporting a positive relationship between turnover and performance is related to the performance curve. Staw (1980) argued that most jobs have an inverted U performance curve simply because performance is generally a joint function of skills and effort. While experience may contribute positively to the development of job skills and knowledge, effort and motivation may be at their highest when the individual first arrives in the organization. The new employee may be optimistic and energetic, but also naïve. In contrast, long-term employees may have accumulated wisdom but also be cynical and less motivated than newcomers. Pfeffer (1979) noted that organizations and work units might differ in performance because of differences in the age and tenure distributions of their employees. On the surface, one might think that a particular learning curve for the individual tenure-performance relationship would also apply to the workgroup. Within a workgroup some members may fulfill the knowledge function while others may serve an energizing function. Therefore, a mixture of younger and older members may lead to more effective group functioning than uniformity at any level of experience.

Figure 1 is based on the Abelson and Baysinger (1984) model of optimal organizational turnover, which can still be regarded as a standard theoretical model for examining the consequences of turnover (Glebbeek & Bax, 2004). Applied to nursing turnover and outcomes, the model measures overall organizational outcomes along the vertical axis (e.g., patient satisfaction and patient safety). The horizontal axis measures the aggregate rate of nursing unit turnover. The convex function suggests a nonlinear relationship between turnover and overall nursing unit effectiveness. On the right side of the figure, the curve slopes downward, representing a negative relationship between turnover and performance. In other words, high voluntary turnover may be detrimental to group morale, cohesiveness, coordination, communication, group learning, and collective knowledge. Conversely, the left side of the curve slopes upward, representing a positive relationship. Some relative low level of turnover creates opportunities for replacements and new employees who may bring with them new knowledge, ideas, approaches, technology, and styles (Mowday, 1981). Very low quit rates can result in the stagnation of worker skills and closed mindedness that, in the aggregate, may reduce nursing unit productivity and increase accidents (Dalton & Todor, 1979). Glebbeek and Bax (2004) found support for an inverted U-shaped relationship between total turnover and net sales among subunits of a temporary employment agency. They expressed reservations, however, about the applicability of their findings to other organizational settings. Furthermore, the logic behind Figure 1 implies that every organization has an optimal turnover rate that is typically nonzero and that the rate is known not the same for all organizations (Abelson & Baysinger, 1984). The optimal turnover rate for different organizations may vary according to differences in the environment and work of the organization; theses factors may affect the balance point

**Figure 1 Nonlinear Relationships between Turnover and Outcomes (Abelson & Baysinger, 1984)**



between costs and benefits of turnover (Abelson & Baysinger, 1984).

*Empirical Studies on Consequences of Nursing Turnover*

There is limited empirical research on the impact of nursing turnover on quality of care, patient satisfaction and safety, staff satisfaction and safety, and productivity and organizational performance (Jones, 2005). Among the published research is a study by Alexander et al. (1994), which examines data from a national sample of 333 community hospitals to test whether turnover and efficiency are related in a curvilinear (inverted U-shaped) relationship due to hypothesized beneficial effects of turnover at medium levels or, organizational-level turnover is positively (linear fashion) associated with organizational inefficiency. They found greater operating inefficiencies in those hospitals that experienced high RN turnover. The linear model was deemed adequate for explaining the relationship between nursing and hospital efficiency. Their findings support the idea that the relationship between turnover and organizational productivity is negative and monotonic. The Voluntary Hospital Association study (Voluntary Hospital Association Health Foundation, 2002) examined the relationship between quality measures (e.g., a risk-adjusted mortality index and a severity-adjusted average length-of-stay) and rates of employee turnover. Including turnover of nurse staff and other employees of health care organizations, the study found a direct relationship between the variables. While health care organizations with the lowest turnover rates (less than 12 %) had the lowest risk-adjusted mortality scores as well as the lowest severity-adjusted length-of-stay, health care organizations with turnover rates over 22 % exhibited a severity-adjusted average length-of-stay of 1.2 days longer than those with the lowest turnover rates. Although these findings do not establish an absolute causal

relationship, they suggest that higher rates of turnover among the nursing staff may lead to decreased efficiency and productivity, which affect patient care.

In nursing home studies, Castle and Engberg (2005) assessed the impact of nursing turnover using data from 354 nursing homes in 4 states. They examined the possible association between staff turnover (e.g., Nurse aide [NA], Licensed practical nurse [LPN], and Registered nurse [RN]) and several quality indicators, including rates of physical restraint use, catheter use, contracture, pressure ulcers, psychoactive drug use, and certification survey data on quality of care deficiencies. They found that for RN showed a negative relationship between turnover and quality for all 6 quality indicators at either the low or medium levels of turnover and for 3 quality indicators at high levels of turnover. The relationship between NA and LPN caregivers and quality also was negative but only at higher levels of turnover. The point estimates suggested a positive relationship between turnover and quality at medium levels of turnover for most quality indicators, although these estimates were not statistically significant. The results suggest that, among RNs, a very stable workforce leads to the highest quality. Zimmerman et al. (2002) determined the relationship between a broad array of structures (e.g., administration, reimbursement, staffing, and physical environment) and processes (e.g., service provision, training, philosophy of care, privacy for staff and resident intimacy, and psychotropic medication) of nursing home care and two outcomes, resident infection and hospitalization for infection. They found that RN turnover was significantly related to both outcomes. With each proportionate loss of an RN (per full-time equivalant/100 beds) the risk of resident infection increases by almost 30% and the risk of hospitalization by more than eighty percent.

In a study of community health clinics, high turnover has been found to have a negative impact on a quality measure (Minore et al., 2005). This study examined the consequences of nursing turnover for the continuity of care provided to residents of three Ojibway communities in northern Ontario, Canada. A chart review of oncology, diabetes, and mental health clients and interviews with health care professional who served the communities were used to find the consequences of nursing turnover. They found a negative impact of nursing turnover on communications, medications management, and the range of services offered. Nursing turnover also resulted in compromised follow-up, client disengagement, illness exacerbation, and an added burden of care for family and community members.

Few studies have focused on the impact of nursing turnover on organizational outcomes and quality of care. Extant studies suggest a negative relationship between nursing turnover and patient outcomes although their causal relationships are not concrete. Study settings of previous research include acute care hospitals, long-term care facilities, and community care clinics. Although the results of these studies might not be comparable with each other due to different study settings, the adverse relationship between nursing turnover and quality of patient care have been found across the research, implying that higher nursing turnover is detrimental to an organization's capacity to meet patient needs and provide quality of care. Additionally, recent empirical research has recognized the underlying mechanisms of turnover and patient outcomes suggested in general turnover research, including demoralization and operational disruption. However, most studies have examined only the direct effects of nursing turnover on quality of care without assessing these underlying mechanisms. Furthermore, empirical studies did not support any positive impact

of nursing turnover on patient care. Therefore, a need clearly exists for research focused on a better understanding of how nurse turnover affects patient outcomes.

*Summary*

Table 2 summarizes the selected studies of nursing turnover consequences reviewed above. Researchers agree that turnover has potential adverse impacts on the initial productivity of new employees and staff morale and productivity. While the negative consequences of turnover have been the focus of most turnover studies, some researchers have suggested positive aspects of turnover, most typically by infusing new blood and keeping the organization from becoming stagnant. As reviewed previously, the scant empirical evidence that does exist suggests that nurse turnover in health care facilities is detrimental to nurse and patient outcomes. Therefore, additional research is needed to understand better the impact of turnover on nurses and patient outcomes.

Although early turnover studies suggested the mechanisms by which turnover affects outcomes, most empirical research on nursing turnover has assessed the direct impact of nursing turnover on patient outcomes. Turnover may affect these underlying mechanisms (e.g., communication breakdown, fragmented coordination, and demoralization), and, through these intermediate effects, it can affect outcomes (Staw, 1980). Therefore, placing intermediate mechanisms into a system can help to develop a theory describing the impact of turnover on patient outcomes.

Existing empirical studies of turnover have measured the aggregated turnover rate at the level of healthcare organization and tested the impact of this aggregated turnover measure on patient outcomes (Alexander et al., 1994; Voluntary Hospital Association Health

Table 2. Selected Studies of Nursing Turnover Consequences

| Author(s) | Purpose | Turnover | Sample/Setting | Findings |
|---|---|---|---|---|
| Alexander et al. (1994) | Test competing arguments that (1) turnover is inversely associated with organizational efficiency, or (2) turnover and efficiency are related in curvilinear (inverted U-shaped) fashion owing to potential beneficial effects of turnover at moderate levels | Annual total turnover and turnover rate of registered nurses | 333 community hospitals | The linear turnover term exhibited both a positive and statistically significant association with log of personnel costs per adjusted patient day. Greater operating inefficiencies were found in those hospitals that experienced high RN turnover. |
| Castle et al. (2005) | Examine the association between nurse aide (NA), licensed practical nurse (LPN) and registered nurse (RN) turnover and quality indicators (physical restraint use, catheter use, contractures, pressure ulcers, psychoactive drug use, and certification survey quality of care deficiencies) in nursing homes | Annual turnover rates (full-time equivalent) | 354 nursing facilities in 4 states | For RNs, there was a negative relationship between turnover and quality for all 6 quality indicators, either at the low or medium levels of turnover, and for 3 quality indicators (catheter use, contractures, and pressure ulcers) at the high level of turnover. The relationship between NA +LPN caregivers and quality also was negative, but only at higher levels of turnover. The result suggests that among RNs, a very stable workforce leads to the highest quality. |
| Minore et al. (2005) | Examine the consequences of nursing turnover on the continuity of care provided to residents | Nursing turnover | A review of 135 charts with 30 professional and paraprofessional healthcare providers who served three Ojibway communities in northern Ontario | Nursing turnover is shown to detrimentally affect communications, medications management, and the range of services offered; it also results in compromised follow-up, client disengagement, illness exacerbation, and an added burden of care for family and community members. |
| Jones (1990) | Develop a methodology to measure nurse turnover costs | Turnover rate | Four acute care hospitals | The mean total cost of nursing turnover reported was $902,590, with a range of $604,402 to $1,651,601. The total nursing turnover cost equaled approximately 11 % of the mean total annual RN salaries paid by the hospitals. The mean cost per RN turnover for the sample was $10,198 with ranging from $6,886 to $15,152. |

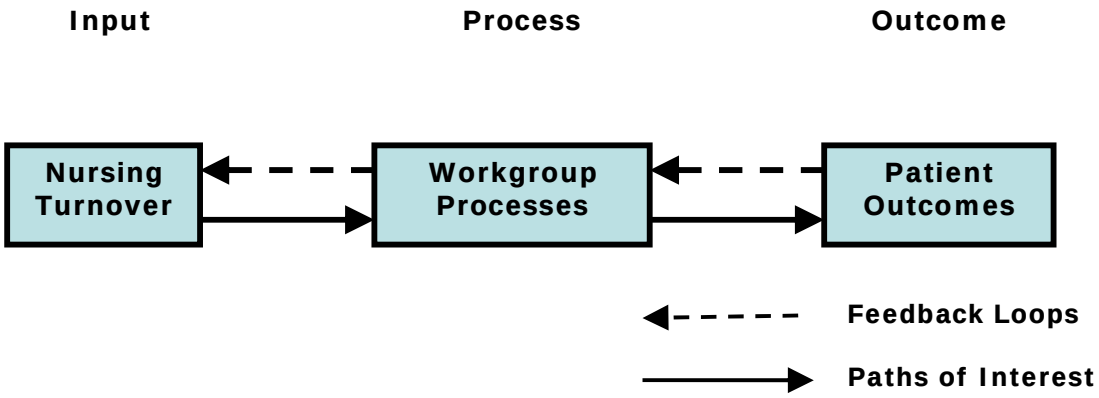
| Author(s) | Purpose | Turnover | Sample/Setting | Findings |
|---|---|---|---|---|
| Jones (2005) | Describe the Nursing Turnover Cost Calculation Methodology (NTCCM) including recent efforts to evaluate its continuing relevance, identify and validate new and emerging nurse turnover cost categories, and update the costs and calculation methods | Nurse turnover (external termination) | An acute care hospital with more than 600 beds | Per RN turnover cost estimated in this study ranged from approximately $62,100 to $67,100 and the total nurse turnover cost ranged from approximately $5.9 million to $6.4 million. |
| O'Brien-Pallas et al. (2006) | Describe a study that was designed to refine a methodology to examine the costs associated with nurse turnover | Nurse turnover | Five medical and six surgical units from four countries (Australia, Canada, New Zealand, and United Sates) | The average cost of turnover per nurse was $21, 514. The mean total direct cost was $6,445 while the mean total indirect cost was $15,069. The highest mean direct cost was incurred through temporary replacements, whereas the highest indirect cost was decreased initial productivity of the new hire. |
| Voluntary hospital association (2002) | Study the relationship between quality assessment and employee turnover rates | Employee turnover rate | Health care organizations | Health care organizations with the lowest turnover rates (less than 12 %) had the lowest risk-adjusted mortality scores as well as the lowest severity-adjusted length-of-stay. Health care organizations with turnover rates over 22 % exhibited a severity-adjusted average length-of-stay of 1.2 days longer than those with the lowest turnover rates (4-12%, 12-21%, and 22-44%). |
| Waldman (2004) | Examine turnover and its costs in the health care environment | Employee turnover | Organizational units within the academic medical center | Turnover cost for nurses ranged from $5,245 to $16,102. The training of nurses generated 59 percent (e.g., $4 million of a total $ 7 million training costs) of total training costs. Over one-fourth of total turnover cost was due to nurse turnover. |
| Zimmerman et al. (2002) | Determine the relationship between a broad array of structure and process elements of nursing home care and resident infection and hospitalization for infection. | Annual registered nurse turnover rate (full-time equivalent) | 2,015 new admission aged 65 and older from a stratified random sample of 59 nursing homes | Registered nurse turnover related to infection and hospitalization for infection (defined as a written diagnosis; a course of oral, ophthalmic, otic, or parenteral antibiotic therapy; or radiographic confirmation of pneumonia). |

Foundation, 2002; Castle & Engberg, 2005; Zimmerman et al., 2002). Studies using the aggregated turnover rate at the hospital level, however, do not consider variations that may be present in turnover and team process factors at less aggregated levels, particularly across nursing units within a hospital; thus, aggregated measures are not sensitive to variations in workgroup mechanisms among nursing units. Because the nursing unit represents a proximal context for nurses as well as a bounded interactive context created by nurses' attributes, interactions, and responses (Kozlowski et al., 2003), the nursing unit provides a study setting to assess more precisely the effects of nursing turnover. Furthermore, taking the nursing unit as the unit of analysis instead of entire health care organization is an important step in understanding how nursing turnover affects patient outcomes mediated by workgroup mechanisms. In addition, assessing the existence of a nonlinear relationship between turnover and patient outcomes would also be beneficial. An understanding of the impact of nursing unit turnover on quality of care and its underlying mechanisms will provide managers and researchers with an improved knowledge of the consequences of nursing turnover and how to intervene in circumstances of high turnover.

## Conceptual Approach and Hypotheses

This section develops a conceptual framework for examining the impact of nursing unit turnover on workgroup processes and quality of care. The proposed model is formulated around an input-process-outcome (IPO) framework posited by McGrath (1964) and illustrated in Figure 2. The IPO framework provides a representative model to assess workgroup behavior and performance effectiveness. Most models of workgroup effectiveness are incorporated into this framework (Kozlowski et al., 2003) and it has been

**Figure 2 Input-Process-Outcome Framework (McGrath, 1964)**



used for organizing and systematizing group behavior and performance in numerous studies (Hackman, 1987). Thus, this conceptual framework is useful for identifying the impact of nursing turnover on workgroup processes and patient outcomes at the nursing unit level. Additionally, a key assumption of this framework is that input affects workgroup outcomes via the interaction that takes place among members. Most research and theory in workgroup effectiveness share McGrath's assumption that process mediates input-outcome relationships because workgroup interaction and interpersonal transactions are readily apparent in all workgroups, which enables to link the way a workgroup is set up to the results of its work (Hackman, 1987). Therefore, by using this conceptual framework, this study explains the mechanisms underlying the effect of turnover on patient outcomes.

In the IPO framework, inputs represent various resources available to the workgroup, both internally and externally, and influence organizational processes, which in turn mediate the effect of inputs on outcomes. In the conceptual framework, nursing unit turnover is the input of interest, while processes represent mechanisms that inhibit or enable the ability of team members to combine their capabilities and behavior. Kozlowski et al. (2003) classified workgroup processes according to affective-motivational, behavioral, and cognitive mechanisms. While affective-motivational mechanisms include cohesion, collective mood or group emotion, collective efficacy, and conflict and divisiveness, behavioral mechanisms include coordination, cooperation, and communication. Cognitive mechanisms include team mental models, transactive memory, and team learning. The selected constructs of workgroup cohesion, relational coordination, and workgroup learning, derived from each workgroup mechanism, are used in this study. Outcomes are criteria used to assess the effectiveness of team actions. Workgroup effectiveness is generally conceived as being

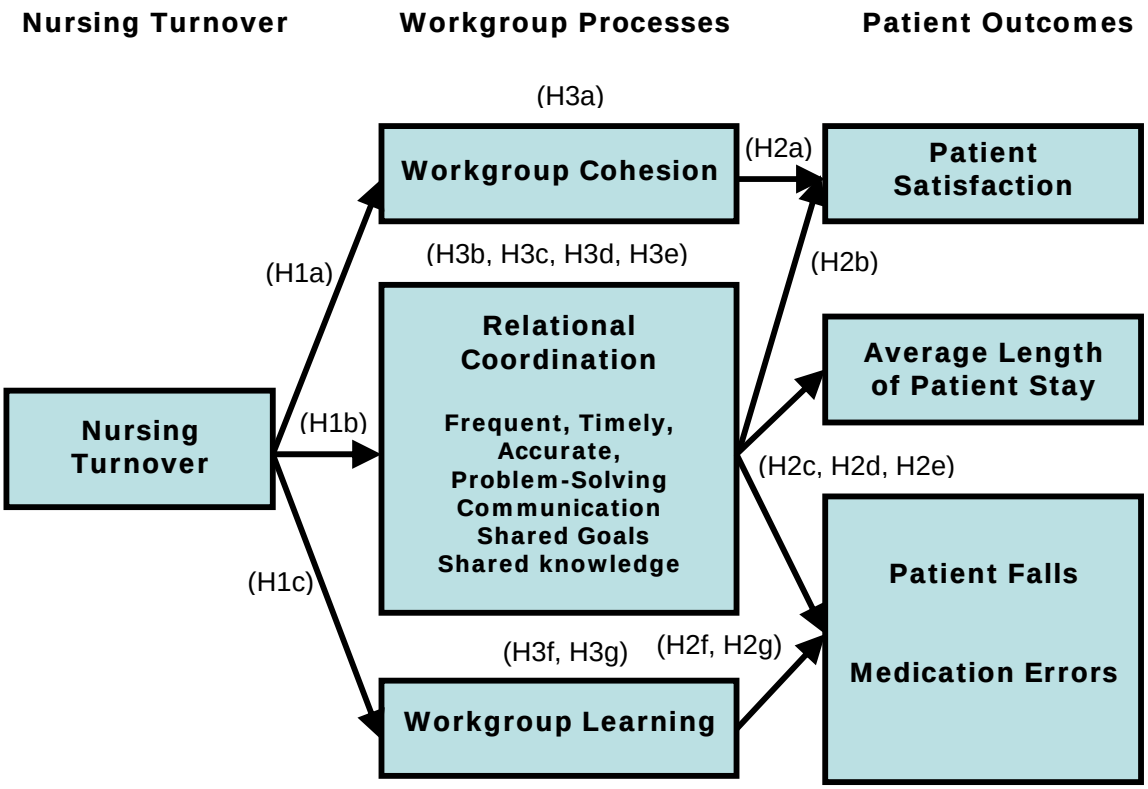
multifaceted, with an emphasis on both internal (e.g., member satisfaction, team viability) and external (e.g., productivity, performance) criteria (Hackman, 1987). In this study, various outcomes (i.e, patient satisfaction, average length of patient stay, patient falls, and medication errors) are assessed.

In Figure 2, the solid arrows leading from nursing turnover to patient outcomes through workgroup processes are the main interest of this study. I will specify these relationships with the hypothesized path model. The dashed arrows in Figure 2 are feedback loops from outcomes, through processes, to inputs (Tannenbaum et al., 1992). In this study, these arrows reflect the possible feedback effects of patient outcomes on nursing turnover mediated by workgroup processes. For example, consider a nursing unit with high levels of nosocomial infections (e.g., urinary tract infection and pneumonia). If the nursing unit did not actively respond to these adverse events by implementing a quality improvement program to reduce the infections, these adverse events will remain uncorrected, and in turn may increase. The increased number of nosocomial infections will affect nurses' perceptions of the quality of care and their work environment in terms of inappropriate resources and insufficient technical support for patient care. Nurses may become frustrated and dissatisfied, and this may affect their motivation to stay in the nursing unit. Therefore, poor patient outcomes may increase the likelihood of turnover. In addition, anticipated and actual turnovers among nurses have been found to be determined by job satisfaction related to the nurse's perception of the quality of care (Hinshaw & Atwood, 1983). Therefore, these feedback loops produce endogeneity of turnover and need to be controlled for in empirical tests of the hypothesized path model.

**Hypothesized Conceptual Framework**

Figure 3 shows the conceptual framework of this study. Nursing turnover as a nursing unit-specific turnover presents separations of nursing staff, specifically RN turnover in this study. It influences workgroup processes: workgroup cohesion, relational coordination, and workgroup learning. These workgroup processes encompass the domains of affective-motivational, behavioral, and cognitive mechanisms classified by researchers of workgroup studies (Kozlowski et al., 2003). Thus, this study assesses the impact of nursing unit turnover on workgroup processes by using selected workgroup processes from each mechanism (i.e., workgroup cohesion, relational coordination, and workgroup learning). General turnover research supports that increased nursing turnover is detrimental to workgroup processes (Staw, 1980; Price, 1977). I will specify relationships between nursing turnover and each workgroup process in the next section. To assess the end-results of nursing turnover, this study uses various patient outcomes as indicators of nursing care. While patient satisfaction with nursing care is an affective patient outcome, average length of patient stay represent care efficiency in the nursing unit. Both patient falls and medication errors are related to patient safety. Reports from the Institute of Medicine emphasized the importance of teamwork in improving efficiency and quality in hospitals (Kohn et al., 2000). Buerhaus and colleagues (2007b) suggest a need to develop workgroup communication and collaboration to improve patient care and patient safety. Workgroup processes (i.e., workgroup cohesion, relational coordination, and workgroup learning) have been found to be associated with better patient outcomes (Meterko et al., 2004; Gittell, 2002; Hofmann & Mark, 2006). This model also suggests the positive effect of workgroup processes on patient outcomes. Finally, this conceptual framework hypothesizes the mediating effects of

**Figure 3 Hypothesized Path Model**



workgroup processes on the turnover-outcome relationship based on the IPO model. In this hypothesized model, workgroup processes support the underlying mechanisms by which nursing unit turnover affects patient outcomes (i.e., patient satisfaction, average length of patient stay, patient falls, and medication errors).

This framework addresses the limitations of previous work in three ways. First, this study uses a more appropriate unit of analysis to explore the consequences of nursing turnover by focusing on the nursing unit rather than on the entire organization. Second, this study allows an in-depth assessment of how workgroup mechanisms mediate the impact of turnover on patient outcomes. Finally, the data allow an examination of potential positive impacts of turnover through an assessment of a nonlinear relationship between nursing turnover and workgroup learning.

## Workgroup Processes

### *Workgroup Cohesion*

Workgroup researchers have offered multiple definitions of cohesion. Festinger et al. (1950) defined cohesiveness as the result of all the forces acting on the member to remain in the group. Goodman et al. (1987) defined cohesion as the commitment of members to the group task. Carron and Brawley (2000) described elements of cohesion. Group integration beliefs reflect the individual's perceptions about what the group believes about its closeness, similarity, and bonding as a whole. Individual attraction to workgroup goals and values reflects the personal motivation to remain in the group, as well as his or her personal feelings about the group. The second element is consistent with Evans and Jarvis's (1980) definition of cohesion, "member attraction to the group," and it is the most common definition of

cohesion (Kozlowski et al., 2003). Gross and Martin (1952) described cohesion in terms of two underlying dimensions – task cohesion and interpersonal cohesion. Task cohesion is defined as a group's shared commitment and attraction to the group task or goal; cohesion is thought to increase commitment to the task and to increase individual effort by group members on the task (Zaccaro & Lowe, 1988). Interpersonal cohesion is defined as the group members' attraction to or liking of the group (Evans & Jarvis, 1980). Interpersonal cohesion allows groups to have less inhibited communication and to coordinate their efforts effectively. The focus of this study is individual nurse's attraction to the nursing unit, reflecting the nurse's motivation to remain in the nursing unit, as well as their feelings about the nursing unit.

Turnover may affect group cohesion because of its disruptive effect on group membership boundaries (Price, 1977). Individuals who are members of a group for a long time frequently interact with other individuals in the group, and some of these interactions may result in friendship-like interaction patterns. In such groups, membership in a group creates conditions of significant interpersonal dependence and recruitment of new members stabilizes membership over time (Hagstrom & Selvin, 1965). With high levels of turnover, the opportunity for continuous interaction declines, and the balanced state is not easily maintained (Price, 1977). Furthermore, as turnover increases, those remaining in the group may see their own fates as less desirable. In turn, they may question their own motivations for staying, and this introspection may itself trigger additional turnover, detachment, and seeking out of salient alternative memberships (Staw, 1980). Drawing from empirical research, Lott and Lott (1965) found that "acceptance by others" and "reduction of cognitive dissonance" affect group cohesion in the presence of other factors (positive interaction, group

reward situation, and competitive inter-group relations). In high levels of nursing turnover, as mentioned above, the opportunity for continuous interaction declines and interpersonal dependency may not be easily formed. In such a nursing unit, nursing staff may not accept and understand the behaviors of other nursing staff during co-work, and they may just follow institutionalized roles, plans, and procedures to deliver nursing care. In turn, it leads to a decrease in the attraction of remaining nurses to the nursing unit. With lower levels of nursing unit turnover, a nursing unit has a stable social and working relationship among its nurses. As turnover increases, this relationship becomes unstable and individual attraction to the nursing unit declines. Therefore, this study suggests a linear relationship between turnover and workgroup cohesion.

*Hypothesis 1a (H1a)*: Higher nursing turnover in nursing units will be related to lower workgroup cohesion.

*Relational Coordination*

Health care organizations generally exhibit very high levels of interdependence (Gittell et al., 2000). Wageman and Baker (1997) defined task interdependence as the degree to which an individual's task performance depends upon the efforts or skills of others. Task interdependence derives from work inputs, the distribution of resources, materials, information, and skills necessary for task completion. Task interdependence can vary from none, as for an individual task executed by one person who has all the resources necessary to complete it to very high, as for a collective task whose successful completion depends on the input and cooperation of multiple individuals. Thompson (1967) identified three forms of interdependence: pooled, sequential, and reciprocal. Pooled interdependence occurs when

individuals conduct their work toward a common goal but without being closely connected. Members simply contribute separately to the larger whole. By contrast, sequential interdependence occurs when individuals work towards a common goal and conduct their work in a pre-defined sequence. Finally, reciprocal interdependence occurs when individuals have close relationships such that interdependence occurs continuously and in both directions. Sequential and reciprocal forms of interdependence are common in health care organizations, resulting in the need for effective coordination (Shortell & Kaluzny, 1997).

Kozlowski et al. (2003) defined coordination as activities required to manage interdependencies within the flow of teamwork. Coordination essentially involves fitting together the activities carried out by organization members, and, as noted, this need arises from the interdependent nature of the activities performed by organizational members (Argote, 1982). The main conceptualization of coordination is integrating disparate actions together in concert with temporal pacing or synchronization (Argote & McGrath, 1993). Zalesny et al. (1995) identified essential elements of coordination and underlying processes, which include identifying goals through conflict and resolution, mapping goals to activities through leadership, assigning tasks, and allocating resources, sequencing, and synchronization.

Georgopoulos and Mann (1962) categorized organizational coordination into programmed and non-programmed coordination. In programmed coordination, organizations develop explicit rules and prescriptions, called programs, which define each person's job as well as the sequence of activities for all jobs within a department and, beyond that, for the organization as a whole. The purpose of programming is to reduce the need for

communication except for questions about the interpretation of a particular rule. The programming of an organization is accomplished with rules, manuals, job descriptions, personnel procedures, and promotion policies. Health care organizations often rely heavily on programming as a means of coordination (Shortell & Kaluzny, 1997). On the other hand, in non-programmed coordination, activities are not specified in advance by the organization. Rather, they are worked out on the spot by organization members. Individuals or groups see a need for coordination, develop a method, and implement it. Thus, much of the coordination may depend upon the willingness and ability of individuals or groups to find their own ways to integrate their activities with other organizational participants. Mutual adjustment provides this spontaneous form of coordination by informal communication among those whose work must be coordinated (Shortell & Kaluzny, 1997).

Gittell (2000) introduced a type of non-programmed coordination known as relational coordination. Coordination requires that workers are aware of their relationships to overall work processes and to other participants in those processes. Relational coordination is characterized by frequent, timely, and accurate problem-solving communication as well as shared goals and knowledge and mutual respect among workers. Strong relationships enable employees to embrace their connections with one another, in turn enabling them to coordinate their work processes more effectively (Gittell, 2002). Gittell (2002) described how each relational domain motivates employees to act with respect to the overall work process: shared goals motivate employees to move beyond goal sub-optimization, shared knowledge informs how their tasks fit relative to other tasks in the work process, and mutual respect encourages employees to value the contributions of others and to consider the impact of their actions on others. Thus, relational coordination may be viewed as the network of

communication and relationships among workers, and it can be thought of as a form of organizational social capital that can improve organizational performance.

High levels of turnover clearly have the potential to affect relational coordination. As explained above, communication patterns are disrupted if valued employees leave (Mobley, 1982; Price, 1977). As turnover increases, communication is likely to become less accurate (Bluedorn, 1982). Existing workgroups are governed by a relatively stable set of norms, role expectations, and shared systems of knowledge and meaning (Kozlowski et al., 2003). In a nursing unit with frequent turnover, those "newcomer" RNs can offer a potential challenge to this stable structure. They are confronted by an ambiguous social and work context, and although they want very much to fit in and learn the work, they need time to assimilate workgroup norms, expectations, and meaning systems. At the early stages of employment, they are still learning the nature of theses communication patterns and norms. In turn, they have less time to engage in coordination. Moreover, in nursing units where increased adjustment time is required for new staff, existing nurses may need to be particularly cautious when supervising new staff, which in turn, may hinder non-programmed relational coordination. As nursing unit turnover increases, a spontaneous form of coordination is not easily achieved and existing relational coordination would be diminished. Thus, the linear relationship between these two variables is hypothesized, which derived from prior research regarding relational coordination and nursing turnover.

*Hypothesis 1b (H1b)*: Higher nursing unit turnover will be associated with lower workgroup relational coordination.

*Workgroup Learning*

Workgroup learning refers to relatively permanent changes in the knowledge of an interdependent set of individuals associated with experience and can be distinguished conceptually from individual learning (Kozlowski et al., 2003). Individual workgroup members learn by experience and share their experiences. Then, the shared experience of individual workgroup members become the property of the entire workgroup through either distribution of lessons learned, or changes in operating procedures (Lipshitz & Popper, 2000). Argote et al. (1999) found that skilled individual learners will not necessarily result in a group that learns collectively. Edmondson (1999) suggests a model of workgroup learning by emphasizing psychological safety, which contributes to workgroup learning behavior. Although workgroups learn through their members, workgroup learning is not simply the sum of the knowledge of individual members (Lipshitz & Popper, 2000).

Organizational learning theorists have offered both descriptive theory, explaining the failure of organizational cognitive growth, and prescriptive theory, proposing interventions to improve organization effectiveness (Levitt & March, 1988; Argyris and Schon, 1978). On the other hand, limited research has been conducted to understand antecedents and consequences of learning behavior in workgroup studies (Kozlowski et al., 2003). Workgroup learning literature has theorized workgroups as information-processing systems and a number of empirical studies have examined information exchange in laboratory groups (Argote, 1999). Edmondson (1999) suggested that learning behavior consists of activities carried out by workgroup members through obtaining and processing data that allow the group to adapt and improve. Examples of learning behavior include seeking feedback, sharing information, asking for help, talking about errors, and experimenting. Through these

activities, teams can detect changes in the environment, improve members' collective understanding of a situation, or discover unexpected consequences of their previous actions.

To the extent that knowledge acquired by learning by doing is embedded in individuals, turnover should affect learning and productivity gains. Turnover may affect the collective knowledge of the workgroup (Kozlowski et al., 2003). If no mechanisms exist for transferring personal experience and knowledge when people leave, lessons of history are lost, and knowledge disappears, reducing the workgroup's collective knowledge. For example, Argote et al. (1995) examined the effects of turnover on group learning in a laboratory. They reported a group learning curve and found that the performance of groups making origami birds increased significantly over six periods, with the performance increase occurring at a decreasing rate. The superior performance of groups without turnover was amplified over periods. Groups with turnover produced significantly fewer products than groups without turnover, and the difference in productivity between two groups was amplified as groups gained experience. In addition, because nursing practice is commonly conducted in the nursing unit, considerable time is required to obtain the organizational specific knowledge and skills required for new staff members to function effectively (Alexander et al., 1994). Thus, high levels of turnover can lead to the deterioration of workgroup memory and group learning.

Researchers generally accept the notion that turnover has a negative impact on workgroup learning. Nonetheless, the organizational learning literature also addresses potential positive aspects of turnover. Hedberg (1981) suggests that learning requires both change and stability between learners and their environments. Although too much stability and unchanging behavior within an organization can lead to stagnation rather than cognitive

growth, excessive turnover may be dysfunctional. The process of learning involves the creation and manipulation of this tension between constancy and change; in fact, a certain amount of stress is necessary if learning is to occur (Cangelosi & Dill, 1965). Organizational learning relies on experience gleaned from addressing similar problems in the past (Levitt & March, 1988). At the same time, learning depends on an individual's ability to learn (Carley, 1992). Turnover and the resulting inflow of new workgroup members may be an important source of various relevant experiences (Campbell, 1965). Therefore, an organization can use turnover as a constant source of input from the environment to help it understand and adapt to outside changes (Staw, 1980). From the discourse of workgroup learning and turnover, the following hypothesis will be tested in the current study.

*Hypothesis 1c (H1c)*: Relative to nursing units with high or low levels of turnover among RNs, nursing units with moderate levels of turnover will experience greater workgroup learning.

**Unit-level Patient Outcomes**

*Patient Satisfaction*

Traditionally, health care professionals have determined a patient's needs based on professional standards and assessments (Merkouris et al., 1999). The 1990s brought to care delivery changes such as a new focus on patient outcomes, new nursing roles, delegation of certain aspects of patient care, and collaborative health care teams (Redmond & Sorrell, 1999). Patient satisfaction began to be understood as an element of quality of care. Donabedian (1987) argued that consumers are "valuable, even indispensable, sources of information in judging the quality of care." Donabedian (1980) urged that patient

satisfaction is an opinion of the quality of care and that it represents specific elements of quality, which are mainly related to the expectations and values of the patient.

In relation to patient satisfaction with nursing care, the most widely accepted definition is that of Risser (1975), who suggests that satisfaction with nursing care is the degree of convergence between the patients' expectation of ideal care and their perception of the care they actually receive. Similarly, patient satisfaction with nursing care is defined as patients' subjective evaluation of their cognitive and emotional reaction to the interaction between their expectations regarding ideal nursing care and their perceptions of the actual nursing care received (Eriksen, 1995). Patient satisfaction as an indicator of nursing care quality has been proposed by many researchers (Eriksen, 1995; Ervin, 2006; Vuori, 1991) and is a tool for evaluating nursing service (Ervin, 2006).

The link between cohesion and workgroup performance is well established; cohesion has been consistently shown to have a positive impact on workgroup performance (Cohen & Bailey, 1997). For example, cohesion was found to be a positive predictor of customer service behavior among 33 retail sales groups (George & Bettenhausen, 1990). Vinokur-Kaplan (1995) found that cohesion proved to be a positive factor affecting hospital treatment team performance. Also, greater cohesion among employees has been found to strengthen employee motivation to provide excellent service, and this strengthened motivation may in turn lead to higher levels of customer (patient) satisfaction (Meterko, Mohr, & Young, 2004). In highly cohesive workgroups, less energy is required to maintain within-workgroup relationships, and more energy can be devoted towards workgroup performance (Deeter-Schmelz & Kennedy, 2003). Furthermore, workgroup cohesion allows a workgroup to have less inhibited communication and to effectively coordinate their efforts (Kozlowski et al.,

2003). A lack of cohesion may contribute to an inability to focus on patient care, which in turn provides poor quality of patient care. This may affect the patients' expectation of ideal care, leading to lower satisfaction with the nursing care received. Therefore, lower cohesion in the nursing unit resulting from higher levels of nursing turnover can create less patient satisfaction.

*Hypothesis 2a (H2a)*: Lower nursing unit cohesion will be associated with lower levels of patient satisfaction.

The care provided by nurses is regarded as the most important factor in patients' assessments of their satisfaction with health care (Johansson et al., 2002). Coordination has been found to generate improvements in both quality and efficiency in non-medical settings (Iansiti & Clark, 1994) and to improve some dimensions of performance in health care settings, particularly in emergency and intensive care (Fargason & Haddock, 1992). With high levels of relational coordination, participants in a workgroup process are expected to more effectively manage their task interdependences, enabling them to improve both the quality and efficiency of their performance (Gittell, 2002). A culture emphasizing effective coordination among healthcare providers has been shown to be positively associated with quality of care (Shortell et al., 1994). Gittell et al. (2000) found that an improvement in patient satisfaction with their overall care was significantly associated with higher levels of relational coordination among care providers. The underlying dimensions of relational coordination, particularly relationships and communication, contribute to our understanding of the relationship between coordination and patient satisfaction. As reviewed previously, relational coordination is a spontaneous form of coordination differentiated from programmed coordination including plans, programs, and relationships specified in advance

by the organization. In nursing units with higher task interdependencies, employees need strong relationships and effective coordination to increase their promptness in patient care. Furthermore, clear communication and information flow have been found to be related to patients' satisfaction with nursing care (Cleary & McNeil, 1988; Ottosson, Hallberg, Axelsson, & Loven, 1997). McColl et al. (1996) found that increased patient satisfaction was related to improvement in the information they received from nurses. In addition, Vahey et al. (2004) found that patients in nursing units characterized by good relationships between doctors and nurses were more than twice as likely as other patients to report high levels of satisfaction with their care. Therefore, high levels of turnover can produce lower relational coordination, which in turn, can be harmful to patient satisfaction.

*Hypothesis 2b (H2b)*: Lower levels of relational coordination between nurses and other health care providers will be associated with lower levels of patient satisfaction.

In this study, the impact of nursing turnover on patient satisfaction is explained by the mediating effects of workgroup cohesion and relational coordination, as incorporated into the IPO framework. This framework indicates that increased nursing turnover is associated with low levels of workgroup cohesion and relational coordination. These processes, in turn, have implications for patient satisfaction. As reviewed earlier, turnover has been found to be inversely related to poor patient outcomes. Leiter et al. (1998) found that patient satisfaction was negatively affected when nurses expressed their intent to leave. With higher levels of nursing turnover, nurses remaining in the nursing unit may question their own motivations for staying and member attraction to the nursing unit may decrease. Such a nursing unit might expend more energy maintaining intra-workgroup relationships and less energy providing high quality of patient care. Furthermore, for interdependent patient care in an

acute care environment, both spontaneous coordination such as relational coordination, and less inhibited communication are required to improve quality of care. With higher nursing turnover, nursing units may not effectively coordinate their effort, and communication among nurses may be less accurate. Therefore, increased nursing unit turnover results in decreased workgroup cohesion and relational coordination. In such a nursing unit, patients may not be satisfied with care they received due to promptness and ineffective coordination by healthcare providers.

*Hypothesis 3a (H3a)*: Nursing unit cohesion will mediate the effect of nursing unit turnover on patient satisfaction.

*Hypothesis 3b (H3b)*: Relational coordination of nurses with other health care providers will mediate the effect of nursing unit turnover on patient satisfaction.

*Average Length of Patient Stay*

Hospitals strive to improve the efficiency of care by reducing patient length of stay (Gittell, 2002), and it is often used as a measure of hospital efficiency (Clarke & Rosen, 2001; Halter, 2006; Murphy & Noetscher, 1999; Thomas, Guire, & Horvat, 1997). Hospitals having a long average length of stay are considered relatively inefficient in their use of resources and those with a short length of stay are considered to be efficient. Reducing length of stay is also a goal of external payers under prospective payment systems (Murphy & Noetscher, 1999). The importance of reducing hospital length of stay is reflected in a large number of studies and publications (Weingarten et al., 1998). In addition, length of stay can be related to quality of care. For example, if hospitals were to respond to the financial incentives of prospective payment by prematurely discharging patients to reduce

costs, a lower than expected length of stay might be indicative of poor quality care. Therefore, controlling patient acuity is an important issue in taking length of patient as an indicator of care efficiency.

Well-coordinated work processes are expected to produce higher-quality outcomes and to do so more efficiently (Gittell, 2002; Yen &Lo, 2004). Shortell et al. (1994) found that health care provider interactions such as communication and coordination are significantly associated with shorter risk-adjusted length of stay. Other researchers have found that nursing care is related to hospital length of stay (Curtin, 2003; Needleman, Buerhaus, Stewart, Zelevinsky, & Mattke, 2006). Several researchers have concluded that improved nurse-physician coordination and communication can reduce the length of stay (Cho, Ketefian, Barkauskas, & Smith, 2003; Halter, 2006; Tschannen, 2005; Zwarenstein & Bryant, 2000). Gittell et al. (2000), as an example, found that length of stay was significantly associated with relational coordination among care providers. Therefore, when nurses are allowed to coordinate the multiple care providers involved in patient care activities, efficiency is improved, which leads to a reduction in the length of stay.

As reviewed previously, low levels of healthcare staff turnover are associated with shorter lengths of stay overall (Voluntary Hospital Association Health Foundation, 2002) and greater hospital efficiency (Alexander et al., 1994). Relational coordination among healthcare providers enables improved care efficiency in acute care hospitals. In highly coordinated nursing units, healthcare providers are able to better communicate about patient information and provide responsive care to patient clinical conditions. In contrast, with higher nursing unit turnover, interactions among healthcare providers are unstable and their coordination depends on programmed coordination such as plans, roles, and policy. Thus, a

spontaneous form of coordination is not easily developed, and communication may be inhibited, in turn, producing care inefficiency. Therefore, the current study suggests that decreased relational coordination is detrimental to care efficiency, leading to a longer length of stay. The association between high levels of nursing turnover and longer lengths of stay can be explained by hindering of relational coordination development by increased turnover and in this nursing unit, patient care may not be provided efficiently.

*Hypothesis 2c (H2c)*: Lower relational coordination between nurses and other health care providers will be associated with longer average length of patient stay.

*Hypothesis 3c (H3c)*: Relational coordination of nurses with other health care providers will mediate the effect of nursing unit turnover on average length of patient stay.

*Patient Falls*

Patient safety is an ongoing concern to health care providers. Among other concerns, patient falls are an indicator of patient safety and may increase health care costs by increasing length of stay (Alcee, 2000). A patient who sustains a fall may incur other costs including pain and suffering, as well as the direct costs associated with an extended hospital stay and loss of time from work (Ruckstuhl, Marchionda, Salmons, & Larrabee, 1991). Falls were studied more often from incident reports than from administrative data (Lake & Cheung, 2006). Extensive incident report data from the national database of nursing quality indicators found a rate of 3.73 falls per 1,000 patient days for the most common types of nursing units (Dunton, Gajewski, Taunton, & Moore, 2004). Another study reported falls among hospital inpatients ranging from 2.3 to 7.0 falls per 1,000 patient days (Hitcho et al., 2004). Patient falls result from a variety of causes. Major precipitating risk factors for falls

in all patient populations include decreased level of consciousness, as often seen in the elderly population, and the administration of medications such as sedatives and hypnotics (Ruckstuhl et al., 1991). Researchers suggest that a key challenge is identifying at risk patients so that preventive measures may be taken (Morgan, Mathison, Rice, & Clemmer, 1985).

The quantity and quality of nursing care are expected to influence the occurrence of patient falls. Patient falls have been proposed as a nursing-sensitive outcome (Lake & Cheung, 2006). The National Quality Forum (2004) recently endorsed falls as a core measure of nursing care performance in hospitals. There have been mixed results from studies examining the relationship between quality of nursing care and patient falls. For example, Blegen and colleagues did not find a significant relationship between total nursing hours per patient day and fall rates in either of two different studies (Blegen, Goode, & Reed, 1998; Blegen & Vaughn, 1998). However, they and other empirical studies support a relationship between the quality of nursing care, especially RN hours, and adverse patient events (Blegen & Vaughn, 1998; Dunton et al., 2004; Mark et al., 2005; Needleman et al., 2006). In relation to nursing care, the nursing role has been emphasized in preventing adverse patient events, encompassing both surveillance and care. For example, the availability of nursing staff affects the basic elements of falls prevention, such as systematic risk assessment at least once per shift (Lake & Cheung, 2006). Thus, patients with more sufficient nursing resources may be expected to experience fewer falls.

As reviewed earlier, timely communication and good coordination among care providers have been found to be associated with superior performance in non-medical settings (Iansiti & Clar, 1994). Other researchers have suggested that collaboration and

communication with other health care providers can affect the outcomes of care (Aiken & Patrician, 2000; Argote, 1982). With high levels of relational coordination, health professionals are able to improve performance in both quality and efficiency (Gittell, 2002). Patient populations at risk for potent ional falls including the elderly population and patients with a decreased level of consciousness, may have more complicated conditions and a greater number of people involved with their care. Thus, these patients have a great need for effective communication among providers, and the information exchanged needs to be timely, accurate, and relevant. Furthermore, higher interdependence among care providers involved with the care of these patients needs effective coordination. For example, Corser (2004) examined the perceptions of health care professionals regarding coordination and elderly patients' outcomes and found that interdisciplinary coordination reduced patient falls. Additionally, enhanced communication and coordination between other health care providers and nurses may result in early recognition of and intervention in potential patient-risks. Therefore, this study suggests that nursing units with a great deal of relational coordination would have lower levels of patient falls.

*Hypothesis 2d (H2d)*: Lower levels of relational coordination between nurses and other health care providers will be associated with increased patient falls.

In health care, patient outcome indicators, such as adverse events, are examples of "failures." The literature addressing errors focuses on not only the development of and adherence to accepted safety protocols, regulations, and rules (Gershon et al, 2000), but also the constructive response to errors such as openly communicating about them and the literature also addresses learning from errors and that social context encourages or discourages these behaviors (Hofmann & Mark, 2006). Kaissi (2006) suggested that

organizations could learn from failure when they continually measure their performance and change their processes in response to past errors. While most health care organizations are extremely rigid and have difficulty in learning from past experience (Merritt & Helmerich, 1996), organizations with tolerance and openness to discussions of failure are expected to perform better in the long run than those that minimized discussion or covered up failure (Sitkin, 1992). This openness is due to a positive learning climate, in which employees facilitate learning behavior by lessening their concern about other employees' reactions to their failures (Edmondson, 1999). Edmonson (1999) found that a shared belief that the workgroup is safe for interpersonal risk taking facilitates actual learning behavior, in turn, improving workgroup performance. In a similar vein, Van Dyck et al (2004) found that employees having shared perceptions regarding error aversion feel stressed or embarrassed after making errors. In a nursing unit, there are a number of practices and policies designed to reduce the occurrence of patient falls. Hence, the adherence to these polices can be reinforced by emphasizing an openness to errors, which in turn, should be associated with an actual reduction in patient falls. Furthermore, this openness to errors may increase the ability of the nursing unit to effectively mange and learn from errors (Edmonson, 1996; Van Dyck et al, 2004). Therefore, the current study suggests that nursing units with the ability to learn from errors can reduce patient falls.

*Hypothesis 2e (H2e)*: Nursing units with lower levels of workgroup learning will be associated with higher levels of patient falls.

High levels of RN turnover have been found to lead to high occurrences of adverse events such as nosocomial infections and pressure ulcers (Castle & Engberg, 2005; Zimmerman et al., 2002). Increased nursing turnover is detrimental to communication

patterns, and effective coordination is hardly formed. Specifically, relational coordination, as a spontaneous form of coordination differentiated from programmed coordination including explicit rules and prescriptions, is carried out through a web of relationships. Strong relationships enable employees to develop their connections with one another, in turn, enabling them to more effectively coordinate. Therefore, relationships among care providers and effective coordination in work processes may not occur, in the context of higher nursing turnover. In such a nursing unit, most coordination may depend on programmed coordination such as workgroup meetings and routines. Considering the patient populations at risk for falls, including the elderly population and patients with low consciousness, this programmed coordination may not be sufficient to prevent patient falls because of the complexity and uncertainty of patient care regarding these patients' conditions. Therefore, decreased relational coordination resulting from high levels of nursing turnover will be associated with a higher occurrence of patient falls. In terms of workgroup learning, moderate levels of turnover is hypothesized to be associated with increased workgroup learning because a balance between constancy and change enables workgroups to learn involving creation and manipulation. In either low or high levels of nursing turnover, the balance is not easily achieved because such units are too rigid or busy to learn from past experiences. With decreased workgroup learning, nursing units are hard to prevent patient falls because adherence to safety polices cannot be reinforced without emphasizing openness to errors. A lack of openness to errors may lead to a decrease in the ability of the nursing unit to mange and learn from errors. Therefore, nursing unit turnover does not play a direct role in patient falls, but factors associated with relational coordination and workgroup learning may explain the mechanisms by which nursing turnover affects patient falls.

*Hypothesis 3d (H3d)*: Relational coordination of nurses with other health care providers will mediate the effect of nursing unit turnover on patient falls.

*Hypothesis 3e (H3e)*: Workgroup learning will mediate the effect of nursing unit turnover on patient falls.

*Medication errors*

Medication error is a broad concept, and several classifications related to drug-related errors exist in the literature. Bates et al. (1995) defined medication error as an error in the process of ordering or delivering a medication, regardless of whether an injury occurred or the potential for injury was present. Adverse drug events (ADEs) are injuries resulting from medical interventions related to a drug, which include both appropriate and inappropriate use of a drug (Bates et al. 1995). Medication errors may result from prescribing mistakes, failed monitoring, patient noncompliance, dispensing errors, and administration errors (Wakefield et al., 1996), including errors of both commission and omission (Carlton & Blegen, 2006). While errors of commission occur when medication administration is violated following the five rights of medication administration (right patient, drug, dose, time and route), errors of omission occur when a patient does not receive a medication ordered (Wakefield et al., 1999). Medication errors are common, costly, and may result in injury. Kohn et al. (2000) suggested that between 2.9 % and 3.7 % of all hospitalized patients experience an adverse event. More than 770,000 people are estimated to be injured or die each year in U.S. hospitals as a direct result of ADEs (Classen, Pestotnik, Evans, Lloyd, & Burke, 1997). Individual hospitals lose millions of dollars related to medication errors (Bates et al., 1997). Although rates of reporting errors vary, with many errors underreported (Wakefield et al.,

1996), medication errors reflect the potential for poor outcomes and have been used in many studies as indicators of the quality of nursing care (Blegen, Goode, & Reed, 1998). In addition, the literature has addressed the fact that many errors are unrecognized or unreported (Blegen et al., 2004; Meurier, 2000; Wakefield et al., 1996). Therefore, this study focuses on medication errors resulting in severe cases, which are less likely to go unreported.

Kohn et al. (2000) suggest that the majority of medication errors are due to unsafe systems rather than individual incompetence. System errors result from multiple factors in complex health care systems (Reed, Blegen, & Goode, 1998). In relation to coordination, a collaborative nurse-physician climate may affect the appropriateness of drug use, the evaluation of proper drug selection and the presence of polymedicine (Schmidt & Svarstad, 2002). In addition, Kopp et al. (2006) found that pharmacists' participation on rounds and physical stationing in nursing units has allowed for improved communication between pharmacy and nursing personnel. This collaboration provides more opportunities to educate nurses on medications with unique administration issues and thus may lead to fewer medication errors. Inadequate or insufficient interaction with other services involved in medication administration may also increase medication errors (Kohn et al., 2000; Leape, 1994; Phillips et al., 2001).

*Hypothesis 2f (H2f)*: Lower levels of relational coordination among nurses, physicians, and pharmacists will be associated with higher levels of medication errors.

Research has suggested that nurses and doctors can learn from their errors, especially when they are able to discuss them with their colleagues within a supportive environment (Edmondson, 1999; Meurier, 2000). For example, Hofmann and Mark (2006) found that open and constructive responses to errors are associated with fewer incidents of medication

errors. The underlying logic is that learning from errors prevents medication errors by defending against the latent and active failures that may have occurred in the previous stage of the medication process (Reason, 1995). While active failures of the medication process would include the unsafe acts such as actual medication errors including wrong dose, wrong patients, wrong time, wrong drug, wrong route, or an error of omission, latent conditions of medication errors are the inevitable "resident pathogens" within workgroups (Reason, 2000). Latent conditions can translate into error provoking conditions such as time pressure, understaffing, fatigue, and inexperience. It may lie within the workgroup for a while before active failures occurs. Nurses in a supportive environment where they learn from errors are empowered to identify and remedy these conditions before a medication error occurs. Not learning from errors and discussing them, however, discourages nurses from acting and also allows errors to remain uncorrected. Therefore, decreased workgroup learning provides a situation in which actual medication errors.

*Hypothesis 2g (H2g)*: Lower workgroup learning will be associated with a higher incidence of medication errors.

As reviewed previously, researchers suggested that nursing turnover has been associated with patient safety (Castle & Engberg, 2005; Zimmerman et al., 2002). Errors occur due to multiple factors in complex health care systems, often resulting from health system design (Berwick, 1989). Relational coordination and workgroup learning may act as a system factor mediating the relationship between nursing unit turnover and medication errors. As nursing turnover increases, coordination in the medication administration process may break down so that the chains of failure in the medication process are connected, which may lead to an increase in medication errors. Furthermore, in such a nursing unit,

uncorrected medication errors are not easily shared or discussed because of fragmented communication patterns, which in turn provoke additional medication errors. In relation to workgroup learning, in low and high levels of turnover, learning from errors is less likely to occur because nurses in such situations are less likely to reveal and to discuss errors. For example, nursing units with low turnover rates and characterized as a rigid work environment may not allow any mistakes. In such a unit, the work environment is unlikely to be supportive of learning from errors. Additionally, units with high levels of turnover give nurses insufficient time to learn from errors because of the time they must spend providing routine nursing care. Thus, high levels of nursing turnover may keep nursing units from leaning from errors. Therefore, following hypotheses are suggested to test mediating effects of relational coordination and workgroup learning on the impact of nursing turnover on medication errors.

*Hypothesis 3f (H3f)*: Relational coordination of nurses with physicians will mediate the effect of nursing unit turnover on the incidence of medication errors.

*Hypothesis 3g (H3g)*: Workgroup learning will mediate the effect of nursing unit turnover on the incidence of medication errors.

## Summary

This chapter presented a review of the literature on nursing turnover and developed a conceptual framework for examining the impact of turnover on workgroup processes and patient outcomes. This chapter developed a direct link between nursing unit turnover and various workgroup processes and the direct relationships between workgroup processes and unit-level patient outcomes. I also hypothesized an indirect relationship between nursing unit

turnover and nursing-unit-level patient outcomes mediated through workgroup process variables. The next chapter will address the research methodology employed in this study.

# Chapter 3

## RESEARCH METHOD

The current study has a two-fold purpose. The first purpose is to describe the relationship between nursing unit turnover and workgroup processes (i.e., workgroup cohesion, relational coordination, and workgroup learning). The second purpose is to explore the mediating impact of workgroup processes on the relationship between nursing unit turnover and unit-level patient outcomes (i.e., patient satisfaction, average length of patient stay, patient falls, and medication errors). This chapter outlines the methodology used in the study. Because the data for the current study were drawn from the Outcomes Research in Nursing Administration Project (ORNA II), the first section of this chapter begins with a description of the ORNA II study, including the study purpose, research design, sample, data, and data collection procedures. The chapter then describes the current study before concluding with a description of the data analysis methods, including a discussion of aggregation, statistical power, and model specification.

### ORNA II Study

The ORNA II study is a research study funded by the National Institute of Nursing Research (grant number 2R01NR03149) and is officially titled “A Model of Patient and Nursing Administration Outcomes” (P.I. Barbara A. Mark, 2001). The ORNA II study is designed to investigate the influence of professional practice and staffing adequacy on organizational, nurse, and patient outcomes.

**Research Design**

The ORNA II study uses a non-experimental, longitudinal causal modeling research design, with the nursing unit as the unit of analysis. Because variables were measured with no manipulation (i.e., with no control or treatment group) (Brink & Wood, 1998), ORNA II is characterized as non-experimental. Three conditions are necessary for establishing a defensible cause-and-effect relationship (Brink & Wood, 1998). First, the independent and dependent variables must be related. Second, the independent variable must be measured prior to measuring the dependent variable of interest. Finally, confounding extraneous variables must not lead to the relationship between the independent variable and the dependent variable. Using these three conditions, the causal nature of the ORNA II study is discussed.

The ORNA II study proposed that context variables are related to structure variables and, in turn, the structure variables are related to organizational effectiveness. The first condition for establishing a causal relationship can be tested simply by assessing whether these variables are correlated with each other. Regarding temporal ordering, the ORNA II study collected data in a way such that the context data were collected prior to the structure data. The structure data were likewise collected prior to the data collected on outcomes. By measuring the same group of participants repeatedly over time, the influence of confounding factors is minimized, thereby allowing a stronger relationship between the explanatory variable of interest and the dependent variables than between the explanatory variable and any confounding variables (Menard, 2002). In addition, some chance of an alternative explanation will always persist, however, and inferences about causation cannot be defended

because non-experimental studies have not randomly assigned control and treatment groups (Brink & Wood, 1998).

**Sample**

The ORNA II sample consisted of 286 general and specialty medical-surgical nursing units throughout the United States from 143 randomly selected non-federal, non-psychiatric, not-for-profit, JCAHO accredited acute care hospitals with more than 99 beds. When a hospital had two eligible nursing units, both units participated in the study. If a hospital had more than two eligible units, an on-site study coordinator selected the units that participated. Inclusion criteria for nursing units were "general" medical-surgical or medical-surgical specialty units. Critical care, operating room, pediatric, obstetric, and psychiatric units were excluded. All registered nurses in each nursing unit who had worked on that unit for at least three months were invited to participate in the study. Ten patients who were 18 or older, able to speak English, and hospitalized on the unit for at least 48 hours were randomly selected from each participating unit to complete a single patient satisfaction survey. As presented in Table 3, the three rounds of data collection occurred during the first, third, and fifth months of the data collection period. The staff nurse response rates using this method were 75% (4,954) at the first round, 58% (3,718) at the second round, and 54% (3,293) at the third round. In addition, the total number of eligible patients was 2,991 (91% response rate).

**Data**

The ORNA II data consist of four levels: community-market, hospital, nursing unit, and individual. Community-market level data (i.e., a hospital's external environment)

Table 3. Calendar for Data Collection

| Name of Questionnaire | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Hospital Level | | | | | | |
| *Hospital Questionnaire* | X | | | | | |
| Nursing unit Level | | | | | | |
| *Personnel Questionnaire* | | | | | | |
| Time 1 | X | X | X | | | |
| Time 2 | | | | X | X | X |
| *Outcomes Questionnaire* | | | | | | |
| Time 1 | X | X | X | | | |
| Time 2 | | | | X | X | X |
| *Financial Questionnaire* | X | X | X | X | X | X |
| Individual Level | | | | | | |
| *Staff Nurse Questionnaire* | | | | | | |
| Time 1 | X | | | | | |
| Time 2 | | | X | | | |
| Time 3 | | | | | X | |
| *Patient Questionnaire* | | | | | | X |

include managed care penetration, geographic region, and urban/rural designation. Information on the hospital's general characteristics includes technological complexity, integrated delivery system membership, teaching status, the number of licensed and maintained beds, the number of admissions and discharge, and inpatient days. Nursing unit level data include personnel, outcomes, and financial data. The personnel data contain information on the number of full-time and part-time nursing personnel, nursing care hours provided by each type of nursing personnel, the type of services that the nursing unit provided, the number of vacant positions, the rate of turnover among nursing personnel, and the number of patient days and discharges. Outcomes data encompass such variables as the number of medication administration errors, severe medication errors, patient falls, urinary tract infections, and the number of nosocomial pneumonia cases. Financial data contain information on the total operating budget, salaries and fringe benefits for personnel, productive time, non-productive time, and overtime.

The individual level data of the ORNA II study were obtained both from staff nurses and patients. In the first round of data collection, staff nurses provided demographic information as well as their perceptions of nursing practices on their unit, including perceptions about the complexity of patient care and work dynamics. In the second round, they provided information on expertise, commitment to care, and autonomy. Finally, in the third round, staff nurses reported on their level of job satisfaction. In the final month of data collection, patients completed questionnaires dealing with their satisfaction with the nursing care and symptom management that they received during hospitalization.

**Data Collection Procedure**

Data collection in the ORNA II study was a complex process that took place over two years. To avoid the problem of dealing with an enormous amount of data, the ORNA II research team randomly divided hospitals by state into two groups. The first data collection group participated in data collection from January through June of 2003, and the remaining hospitals collected data from January through June of 2004. Post-hoc analysis revealed no significant difference between the two groups in any aspect (Gates, 2005). In addition, data collection was completed in a sequential order to provide the time or condition of the main explanatory and outcome variable. In other words, the data on hospital and nursing unit characteristics were collected prior to the nurse and patient outcome data (Table 3).

To collect the data, each participating hospital appointed a study coordinator who was in charge of the study in their facility. All study coordinators participated in a 1.5-day training session conducted by the ORNA II research team. This training familiarized them with the goals of the study, and insured conformity and consistency in data collection across study sites. During the data collection period, the research team reviewed data for integrity and contacted study coordinators to resolve data discrepancies.

Because of a tendency in survey research for low responses rates (Anema & Brown, 1995), the ORNA II study implemented the Total Design Method for the individual nurse questionnaires (Dillman, 1978). This method includes providing respondents with a detailed cover letter explaining the intent of the research, emphasizing the importance of participation to the success of the study. Staff nurses received the first reminder with a duplicate questionnaire two weeks after the questionnaire was distributed. Two weeks later, a second reminder letter with a duplicate questionnaire was delivered. The final reminder was

provided two weeks later to all eligible participants, including both those who had already participated and those who had not yet participated, to encourage completion of their questionnaires.

## Current Study

Although the ORNA II study was designed as a longitudinal causal modeling study, the current study adapted a cross-sectional study design with a lagged information approach. Kenny (1973) introduced the lagged information approach for cross-sectional studies. According to him, true experiments control for spurious causal relations by random assignment to treatment groups, providing that there is no systematic relation between the dependent variable and the treatment. A cross-sectional study using the lagged approach investigates causality in the absence of a true experimental design, but only in a passive manner. That is, instead of addressing the traditional causal questions of whether the explanatory variable causes the outcome variable, the lagged analysis examines the predominant cause-effect direction. As such, it should be viewed as an indicator of temporal precedence and not as positive proof of causation. The conceptual framework in this study was formulated by the IPO framework. As reviewed earlier, this framework suggests not only a causal relationship of the input-process-outcome but also feedback loops between patient outcomes and nursing turnover. With the lagged information approach, because the input variable was measured prior to the process and outcome variables, this study allows for the control of the feedback effects of patient outcomes on nursing turnover. Therefore, the cross-sectional research design with the lagged information approach was used in this study to assess the causality of the turnover-process-outcome relationship.

The final dataset for this study consisted of 268 nursing units from 141 hospitals Seventeen nursing units were excluded due to missing values for selected variables and one nursing unit was excluded due to an extreme value of severe medication errors, reflecting possible measurement errors (16.86 errors per 1000 patient days vs. 0.77 severe medication errors ranging from 0 to 8 errors in the final dataset). It was suspected that this nursing unit may treat all medication errors with increased nursing observation and extra care regardless of their severity, which in turn, results in this extremely high occurrence of severe medication errors. Thus, this nursing unit was excluded from the study. Post-hoc analysis revealed no significant difference in the study variables between the two groups, except severe medication errors. Tables 4 and 5 described the data sources for the selected study variables. Data from each hospital were obtained during four rounds of data collection over six consecutive months. The research model determined the temporal ordering of the data collected with information about turnover and control variables (work complexity, nurse experience, nurse education, hospital size, technology complexity, and teaching status) obtained prior to collection of workgroup processes data (relational coordination and workgroup learning), thus allowing limited conclusions about causality. Later, for three consecutive months, information about patient outcomes (average length of stay, patient falls, and medication errors) and additional control variables (unit size and nurse staffing) were obtained. In a similar vein, prior to obtaining data on workgroup cohesion variables, nursing unit turnover rates during March and April were measured. In the final month of data collection (June), patient-level information was obtained, including satisfaction with care, age, health status, and previous hospitalizations.

Table 4. Sources of Selected Variables

| Variables | Information sources |
|---|---|
| **Explanatory variable of interest** | |
| Nursing unit turnover | Personnel Questionnaire |
| | |
| **Process variables** | |
| Workgroup cohesion | Staff Nurse Questionnaire |
| Relational coordination | Staff Nurse Questionnaire |
| Workgroup learning | Staff Nurse Questionnaire |
| | |
| **Outcome variables** | |
| Patient satisfaction | Patient Questionnaire |
| Average length of patient stay | Personnel Questionnaire |
| Patient falls | Outcomes Questionnaire |
| Medication errors | Outcomes Questionnaire |
| | |
| **Control variables** | |
| Work complexity | Staff Nurse Questionnaire |
| Unit size | Personnel Questionnaire |
| Nurse education level | Staff Nurse Questionnaire |
| Unit tenure | Staff Nurse Questionnaire |
| RN hours | Personnel Questionnaire |
| Hospital size | Hospital Questionnaire |
| Technology complexity | Hospital Questionnaire |
| Teaching status | Hospital Questionnaire |
| Patient age | Patient Questionnaire |
| Health Status | Patient Questionnaire |
| Previous Hospitalization | Patient Questionnaire |

Table 5. Time Sequences of Selected Variables

| **Variables** | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| **Explanatory variables** | | | | | | |
| Nursing unit turnover | X | X | X | X | | |
| **Process variables** | | | | | | |
| Workgroup cohesion | | | | | X | |
| Relational coordination | | | X | | | |
| Workgroup learning | | | X | | | |
| **Outcome variables** | | | | | | |
| Patient satisfaction | | | | | | X |
| Average length of patient stay | | | | X | X | X |
| Patient falls | | | | X | X | X |
| Medication errors | | | | X | X | X |
| **Control variables** | | | | | | |
| Work complexity | X | | | | | |
| Unit size | | | | X | X | X |
| Nurse education level | X | | | | | |
| Unit tenure | X | | | | | |
| RN hours | | | | X | X | X |
| Hospital size | X | | | | | |
| Technology complexity | X | | | | | |
| Teaching status | X | | | | | |
| Patient age | | | | | | X |
| Health Status | | | | | | X |
| Previous Hospitalization | | | | | | X |

## Measures

This section discusses the definitions and measurements of the selected variables used in the current study.

### *Explanatory Variables of Interest*

#### *Nursing Unit Turnover*

As reviewed in Chapter 2, turnover is the degree of individual movement across the membership boundary of an organization (Price, 1977). Although movement can occur as either accessions or separations from organization, the current study focuses on separations. Voluntary and involuntary turnover are commonly distinguished. Research on turnover generally examines voluntary movement; however, consequences induced by employees' departures and by new employees' arrivals occur regardless of the reason for staff movement. The current study, therefore, includes and does not distinguish between voluntary and involuntary turnover. Similarly, because the impact of nursing unit turnover on workgroup processes occurs regardless of whether staff leaves from the nursing unit or from the hospital, the current study uses both internal (e.g., transfers) and external turnover. Therefore, the current study defines turnover as a nurse's resignation from his or her employment with the hospital, retirement, or transfer to another unit in the hospital.

The main explanatory variable is the crude turnover rate of registered nurses (RN) in each nursing unit. Total turnover is based on the number of registered nurses on the nursing unit, excluding agency RNs, per diem RNs, RNs who floated to the unit from other areas of the hospital, and any unit personnel who spent less than 50% of their time in direct patient care (e.g., nurse managers, assistant nurse managers, and nurse educators). The denominator of the turnover rate is the average number of RNs over the period.

In order to measure turnover for a reasonable period of time prior to measuring the process and outcome variables, turnover rates of two different periods were used as the explanatory variables of interest. The crude turnover rate between March and April was the explanatory variable of interest to examine hypotheses 1a, 2a, and 3a. This turnover rate captured nursing unit turnover just prior to measuring workgroup cohesion and also prior to measuring patient satisfaction. This study used the crude turnover rate between January and February for testing the remainder of the hypotheses (i.e., H1b to H1c, H2b to H2g, and H3b to H3g). These turnover rates were measured prior to collecting data on relational coordination and workgroup learning. Subsequently, information on average length of patient stay, patient falls, and medication errors were measured.

To test the proposed conceptual model, two different functional forms of turnover rates were explored: a linear function and a dummy variable of turnover. The linear term of turnover was used to test the relationship between turnover and workgroup processes (workgroup cohesion and relational coordination) and turnover's relationships with patient satisfaction and average length of patient stay. The dummy variable of turnover was used to detect a nonlinear relationship between turnover and workgroup learning. The turnover rates were grouped into 5 categories: zero (reference group), low, moderate, high, and very high, which were specifically, defined as rates of 0 (119 units), greater than 0 to 3.2% (24 units), greater than 3.2% to 4.5% (24 units), greater than 4.5% to 7.4% (49 units), and greater than 7.4% (52 units), respectively. The low category was used because the level at which turnover may be beneficial to workgroup learning has been reported to lie somewhere between 10% and 20%, although this likely varies for different organizations and industries (Abelson & Baysinger, 1984). The level for different organizations is likely to vary

according to differences in circumstances influencing the balance point for workgroup learning. In healthcare settings, there is limited discussion about the balance point beneficial to workgroup learning. Thus, this study used a turnover rate of 3.2%, the equivalent to 19.2 % annualized turnover. Similarly, the level at which turnover adversely influences learning is unknown. Based on the work of Price (1977), Castle and Engberg (2005) used 50% as a quoted level. Taking the study settings into consideration (nursing homes vs. hospitals), the current study used 4.5% (median turnover level) and 7.4%, which project to rates of 27.0% and 44.4% annualized turnover, respectively. Therefore, the four dummy variables of turnover allowed an investigation of how workgroup learning differs by turnover groups compared to one in nursing units with 0% turnover. The four turnover coefficients capture the relationship between turnover and workgroup learning.

*Process Variables*

*Workgroup Cohesion*

Four items from the Nurse Job Satisfaction Scale (Hinshaw & Atwood, 1985) were used to measure workgroup cohesion. This instrument utilized a Likert-type format with 6 response options (ranging from "strongly agree" to "strongly disagree" with no neutral option) and the possible total scores ranged from 4 to 24. These total scores were rescaled into the original 6 response options to facilitate interpretation of the scores and to reduce the number of missing values of selected variables. Thus, scores can range from 1 to 6 with higher scores indicating higher levels of workgroup cohesion. A sample item from this scale is, "There is a good deal of teamwork and cooperation among the various nursing staff on this unit." This instrument exhibits consistent reliability and validity (Sauter et al., 1997).

Based on the recommendations of Sauter et al. (1997), the items of this scale were modified in the ORNA II study so that they consistently assessed a nurse's perception of his or her unit (Gates, 2005). Principal axis factoring yielded a single-factor solution with all factor loading greater than 0.50. Furthermore, the internal consistency of the 4 items in the current study was 0.76.

*Relational Coordination*

Relational coordination was measured with the Relational Coordination Scale (Gittell et al., 2000). The original Relational Coordination Scale is a five-point Likert-type scale that asks health care providers in various disciplines to assess the quality of their collaboration with each of nine other disciplines. The Relational Coordination Scale encompasses four communication dimensions (frequent, timely, accurate, and problem-solving communication) and three relationship dimensions (shared goals, shared knowledge, and mutual respect). The questions do not ask for retrospective reports; rather, they ask respondents to describe current working conditions. The focus on current working conditions was expected to avoid the common problem of retrospective response error (Gittell, 2002). In Gittell's study, disciplines included attending MDs, house staff, physical therapists, lab technicians, case managers/social workers, pharmacists, radiologists, and dietary staff. Gittell et al. (2000) reported Cronbach's alpha of 0.85 for the total scale.

The ORNA II study asked nurses to evaluate their level of relational coordination with other health care providers. Relational coordination, measured by nurses' perception of coordination with all other health care providers, was used to test hypothesis 2b. This hypothesis addresses the relationship between relational coordination and patient satisfaction. Better coordination between nurses and all other disciplines is hypothesized to lead to higher

quality care, which in turn has a positive impact on patient satisfaction. In a similar vein, in relation to average length of patient stay and patient falls, relational coordination with all other health care providers was used because of their importance to care efficiency and patient safety. Finally, relational coordination with physicians and pharmacists was used for assessing the relationship with medication errors since those two disciplines, along with nurses, are most frequently involved in medication errors and their avoidance. In addition, the study used items on the four communication dimensions with response options ranging from "always" to "never" with higher scores indicative of better communication. Items on two relationship dimensions were attached to response options ranging from "completely" to "not at all" or "everything" to "not at all" with higher scores indicative of better relationship. This study rescales the possible range of scores from 6 to 30 to 1 to 5 (5 response options) because of interpretability of the scores. Cronbach's alphas of relational coordination with other health care providers, and physicians and pharmacists are 0.95 and 0.87, respectively.

*Workgroup Learning*

Workgroup learning was measured by using five items from the Error Orientation Questionnaire developed by Rybowiak et al. (1999). This scale was originally developed to measure the degree of error-oriented climate in a workplace. The items on the scale reflect learning dimensions such as whether employees actively think about and diagnose the sources of errors, thus, making this questionnaire an appropriate measure of workgroup learning in this study. A sample item from this scale is, "On this unit, after a nurse makes a mistake, we think about how it came about and how to prevent the same mistake in the future." Items on this 5-point Likert-type scale were attached by response options ranging from "strongly disagree" to "strongly agree," with higher scores indicative of greater

workgroup learning. Furthermore, principal axis factoring confirmed that the scale has only one factor with all six items having factor loading greater than 0.50. In addition, Cronbach's alpha for this scale is 0.92, indicating a strong internal reliability consistency.

*Dependent Variables*

*Patient Satisfaction*

As described previously, data on patient satisfaction were collected from 10 randomly selected patients on each hospital unit during the last month of the data collection in the ORNA II study. The scale addresses satisfaction with the overall courtesy and friendliness of the nursing staff, the promptness with which nurses provided assistance, the satisfaction with how the nursing staff works together, and the level of comfort in sharing concerns with the nurses. Patients were asked to complete a 13-item Likert-type questionnaire with 4 response options ranging from "poor" to "excellent" or "never" to "always" with no neutral option. Scores on this scale could range from 13 to 52 with higher scores indicating greater patient satisfaction. The final scores were rescaled into 4 responses options. Five items in this scale were taken directly from the work of Dameier (1994). The remaining 8 questions came from a study by Carey and Seibert (1993). The combination of items from these two patient satisfaction scales allowed the development of a measure of overall patient satisfaction. Principal axis factoring confirmed that all the loading of one factor solution are greater than the minimum of 0.50 proposed by Nunnally and Bernstein (1994). In addition, the patient satisfaction scale has a Chronbach alpha of 0.92, indicating strong internal reliability consistency.

*Average Length of Patient Stay*

Length of stay is the number of inpatient days of care utilized by a given patient. This variable was measured by the total number of patient days of each unit divided by patient discharges.

*Patient Falls*

The rate of patient falls was measured by the total number of patient falls reported for each unit divided by the number of patient days. The rate of patient falls was defined as the number of incidents per 1,000 patient days.

*Medication Errors*

Medication errors were defined as errors related to the wrong dose, wrong patient, wrong time, wrong drug, wrong route, or an error of omission. To minimize reporting bias, which is often a problem with measuring medication errors, the current study used a measure of medication errors resulting in severe outcomes because they are less likely to go unreported. These errors increased the need for nursing observation, technical monitoring, laboratory and radiographic testing, medical intervention or treatment, or transfer of the patient to another unit. They are measured as the number of incidents per 1,000 patient days.

*Control Variables*

With respect to the time sequence of data collection, the following variables–work complexity, unit size, nurses' education and experience, and hospital characteristics–are used to control alternative explanations of workgroup processes and outcomes. In addition to control variables above, nurse staffing, and patient characteristics are used to control possible alternative explanations of patient outcomes.

*Work Complexity*

Campbell (1988) addressed characteristics of work complexity that involve an increase in information load, information diversity, or rate of information change as a contributor to complexity. Four basic task characteristics meet this requirement: the presence of multiple potential ways to arrive at a desired end-state, the presence of multiple desired outcomes to be attained, the presence of conflicting interdependence among paths to multiple outcomes, and the presence of uncertain or probabilistic links among paths and outcomes. These characteristics imply a high level of information load, diversity, or rate of change.

Work complexity not only has implications for workgroup cohesion, coordination, and workgroup learning (Argote et al., 1995; Argote 1982; Gittell 2002; Lott & Lott, 1965), but it also contributes to work conditions that affect efficiency and quality of care. As an example of how work complexity could be applied, consider the complexity associated with patient conditions in two internal medicine units in a hospital. In one unit, about 16 different patient conditions are seen on average in a given time period and are about equally likely to occur. In the other unit, a quarter of the unit's patients have colds or respiratory problems that could have been handled in a doctor's office, while the other three-quarters of the patient load fall into six conditions that occur about equally often. The latter unit, which encounters fewer alternatives and one alternative that is more likely than the others, deals with less complexity than the former unit, which encounters many equally likely alternatives. The former unit, therefore, faces more chances for mistakes and likely expends more resources on patient care. Furthermore, a poor work environment characterized by uncertain work conditions may increase dissatisfaction of care (Johansson et al., 2002; Vahey et al., 2004), lengths of stay (Murphy & Noetscher, 1999), patient falls (Dunton et al., 2004), and

medication errors (O'Shea, 1999; Reilley, Grasha, & Schafer, 2002; Roseman & Booker, 1995).

In addition to care complexity (e.g., how many patients require the use of technical equipment and how many patients require IV medications through central venous line or port), the ORNA data collected information about work characteristics such as frequent interruption or unanticipated events (e.g., nurses on this unit could do a better job if they had more control over the types of patients they were assigned and frequent movement of patients on and off the unit for diagnostic studies, procedures, etc, makes it difficult for nurse on this unit to do a good job). This work characteristic was measured by using a 7-item Likert-type questionnaire developed to measure perceived environmental uncertainty (Salyer, 1996). Although this measurement is not exactly equal to work complexity as reviewed above, in order to represent the uncertainty and complexity of nursing unit dynamics, it would be a better measurement than only assessing care complexity. Once nurses adapt to patient care requiring sophisticated nursing skills and particular procedures (e.g., IV medications through a central venous line or port), these nursing procedures become routine and the nurses are able to deal with them. On the other hand, incorporating work complexity with the extent to which a nursing unit was characterized by frequent interruptions or unanticipated events indicates work complexity for workgroup processes. Therefore, the variable measuring work characteristics involving interruption or an uncertainty of nursing unit dynamics would be a better indicator for reflecting the complexity of work procedures and dynamics among care providers. This scale is structured with 6 response options ranging from “strongly disagree” to “strongly agree.” This variable also was rescaled from 7 through 42 to 1 through 6. The

principle factor analysis confirmed the one factor solution. Cronbach's alpha in the current study is 0.85.

*Unit Size*

In previous research, unit size has been linked to nursing unit performance by using an information processing approach (Dobal, 1995). Mark et al. (2003) found more patient falls in larger units and less satisfaction among patients in larger units as compared with smaller units. Unit size was measured as the number of beds available for occupancy.

*Education Level and Unit Tenure*

In the nursing literature, knowledge and performance have often been studied in relation to nurses' education and experience. Johnson (1988) addressed the issue of performance differences among education levels. She found that baccalaureate nurses (BSNs) performed professional behaviors such as communication, problem solving, and professional roles and that BSNs teach better than diploma nurses but that diploma nurses performed technical skills better than BSNs and were more bureaucratically oriented. Findings on the influence of nurses' experience on practice characteristics, however, are mixed (Blegen et al., 2001; Kovner & Schore, 1998; Young et al., 1991). Therefore, this study used nurses' education and experience to control alternative explanations of causal relationships among turnover, processes, and patient outcomes.

Education was defined as the proportion of nurses on each unit whose highest education level was a bachelor's degree or higher. Unit tenure was defined as the average of each nurse's tenure on the current unit as measured in months.

*RN Hours*

Nursing staffing issues have been studied in the context of working conditions for

nurses and are believed to be a determinant of the quality of nursing care and patient outcomes. Several studies have provided empirical evidence that nurse staffing affects patient outcomes (Blegen et al., 1998; Cho et al., 2003; Kovner et al., 2002; Mark et al., 2004; Needleman et al., 2002). Outcomes that have been examined include mortality (Cho et al., 2003; Mark et al., 2005; Mark & Harless, 2007; Mark et al., 2004), length of stay (Mark et al., 2005; Mark & Harless, 2007; Needleman et al., 2002), and adverse events such as medication errors, patient falls, and pressure ulcers (Cho et al., 2003; Lake & Cheung, 2006; Needleman et al., 2002). In addition, Seago et al. (2006) found that patient satisfaction increased as RN hours/total hours and total hours of care per patient day increased.

RN staffing was measured by taking the ratio of RN hours, which is the percentage of nursing care hours delivered by RNs (i.e., permanent, float and per diem, and agency RNs), to the care hours delivered by all nursing personnel (all types of RNs, LPNs, and unlicensed nursing personnel). RN hours ranged from zero to 100 percent of nursing care hours.

*Hospital Characteristics*

Characteristics of the hospital environment included hospital size, technological sophistication, and teaching status. Larger organizations with better supporting systems for patient care might increase the resources dedicated to improving quality of care and efficiency (Daft, 2004; Keeler et al., 1992; Kuhn, Hartz, Gottlieb, & Rimm, 1991). High technology services have been linked to quality of care (Kuhn et al., 1991). Teaching hospitals are linked to quality of care and hospital efficiency. Patients in teaching hospitals are typically sicker and receive more aggressive and complex care than do patients in non-teaching hospitals (Iezzoni et al., 1990). Teaching hospitals also have on average better resources for providing patient care. Studies have found higher levels of quality in teaching

hospitals (Hartz et al., 1989; Keeler et al., 1992). Thus, this study controls for key hospital characteristics.

Hospital size was measured as the number of maintained beds. Technological complexity was measured using the Saidin index, which is a weighted sum of the number of technologies and services available in a hospital. The weights are the percentage of hospitals in the country that do not possess the technology or services (Spetz, 1999). Teaching status was defined as the ratio of medical and dental residents to the number of maintained beds.

*Patient Characteristics*

Patient characteristics include patient age, perceived health status, and previous hospitalization, which is an indicator of patient acuity. Studies suggest that older patients report greater satisfaction with their care and that have fewer complaints (Ross, Steward, & Sinacore, 1995). In addition, medication errors and falls are more likely to occur among older patients (Thomas & Brennan, 2000). Furthermore, elderly patients are more prone to hospitalization related to complications like nosocomial infection and de-conditioning, which prolong hospital stays (Lim, Doshi, Castasus, Lim, & Mamun, 2006). In this study, health status and previous hospitalization are used as proxy measures of patient co-morbidities, which are associated with lower levels of satisfaction (Elder, Neal, Davis, Almes, Whitledge, & Littlepage, 2004), increased length of stay (Gittell, 2002), and risk of patient falls (Corser, 2004) and medication errors (Evans, Lloyd, Stoddard, Nebeker, & Samore, 2005).

Patient age was measured as the average age of patients in each unit who completed the patient satisfaction scales. Health status measured patients' perceptions of their health status with five categories from "very poor" to "very good." The variable of previous

hospitalization was a dichotomous variable denoting whether or not a patient had been hospitalized with "Yes" coded as 1.

## Data Analysis

This section addresses data analysis plan followed by attributes of the data. The current study used both linear (ordinary least squares, random effects, and fixed effects) and count (Poisson distribution with adjustment for overdispersion) models depending on the distribution of the process and outcome variables.

### *Data Aggregation*

The unit of analysis in this study is the nursing unit. Addressing the appropriateness and method of data aggregation is important (Verran, Mark, & Lamb, 1992). As reviewed previously, studies using the hospital as the unit of analysis could not account for variations in workgroups within the hospital. Furthermore, taking the nursing unit as the unit of analysis is an important step to understanding how nursing turnover affects patient outcomes mediated by workgroup mechanisms.

Workgroup cohesion, relational coordination, workgroup learning, patient satisfaction, and work complexity were measured at the individual level and needed to be aggregated to the unit level. Because individual nurses completed these questionnaires to measure nursing unit dynamics and patient-reported perception about nursing unit care, data aggregation is justified. Statistical procedures can justify the aggregation of lower level data to higher units of analysis such as interrater agreement ($r_{wg}$) and intraclass correlation coefficient or ICC(1). While the $r_{wg}$ is used in the event that observed group variances differed from some

theoretically expected random variance, ICC(1) assesses how within-group variance contrasts with between-group variance. This procedure assesses the extent to which lower level data (i.e., nursing unit level data) are homogeneous within units. They are often used in complementary ways to justify aggregation to higher levels (Klein & Kozlowski, 2000).

James et al. (1984) developed the $r_{wg}$ to determine within-unit variability for a measure within a single unit. If variability within the unit is considerably smaller than expected, the $r_{wg}$ will be closer to one, which justifies the aggregation of individual data to the unit-level for that particular unit. The common threshold for such justification an $r_{wg}$ value equal to or greater than 0.70 (Klein & Kozlowski, 2000). As summarized in Table 6, the mean $r_{wg}$ scores for the selected variables were over the 0.70 threshold, ranging from 0.72 to 0.99 and therefore indicating adequate within-unit agreement.

The reliability of the aggregated data was evaluated by the proportion of variance explained by unit membership using ICC(1) and the mean rater reliability of the aggregated data using ICC(2). Although no agreement upon the target for the ICC(1) exists, a larger ICC(1) is generally accepted to indicate a greater similarity among raters (James, 1982). On the other hand, ICC(2) provides the estimates of the reliability of the group means within a sample (James, 1982; Klein & Kozlowski, 2000). As group size increases, the ICC(2) is larger because group means with many people per group are more stable and more reliable measures than group means with fewer people per group (Klein & Kozlowski, 2000). ICC(2) values of 0.70 or higher indicate adequate group-level reliability.

Table 6 shows that the relational coordination with other health care providers, workgroup learning, and patient satisfaction variables show relatively low ICC(1) values (0.0913, 0.0830 and 0.665, respectively ) as compared to the other variables. The ICC(2)

Table 6. Statistics for Data Aggregation

| Variable | $R_{wg}$ | ICC(1) | ICC(2) |
|---|---|---|---|
| Workgroup Cohesion | .8248 | .1330 | .6425 |
| Relational coordination with other health care providers | .9905 | .0913 | .5672 |
| Relation coordination with Physicians and Pharmacists | .9721 | .1264 | .6538 |
| Workgroup Learning | .8440 | .0781 | .5249 |
| Patient Satisfaction | .9254 | .0665 | .4066 |
| Work Complexity | .7219 | .1516 | .7558 |

values for these variables are far below 0.70 (0.5672, 0.5507, and 0.4066, respectively). Klein and Kozlowski (2000) indicated that aggregation is justified when the F test for ICC(1) values is significant. In the current study, the F test supports the aggregation of individual-level data to the unit-level.

Furthermore, small unit sizes (17.32 nurses) can result in low values for ICC(2) (Klein & Kozlowski, 2000). In addition, patient heterogeneity, a mixture of patient conditions, could have lowered the ICC(2) for patient satisfaction. Patient satisfaction does, however, have an $r_{wg}$ above 0.70, providing more justification than the other aggregation measures (Hofmann, Griffin, & Gavin, 2000) and, thus, justifying the aggregation of patient satisfaction scores.

*Statistical Power*

Large samples give stability to the estimated parameters (Ferketich & Verran, 1990), and the question of appropriate sample size is assessed through power analysis. The power of a statistical test is the probability that it will yield a statistically significant test in the situation as present (Cohen, 1988). According to Cohen (1988), the minimum acceptable level of power in an analysis is 0.80. Because statistical power is positively related to the number of observations used in one's analyses, the power of analyses conducted at the nursing unit level were examined in this study. The power for all sets of hypotheses (i.e., the direct effects of the turnover, the direct effects of workgroup processes, and the mediating effects of workgroup processes) was calculated in the same general way. The primary area of interest in this study is the additional amount of variation in the outcome variables explained by turnover variables in all other things being equal to zero. Thus, using Cohen's

power tables, in which the significance level is set at alpha = 0.05, u = 1 to 4 (the linear term of turnover, 4 dummy groups of turnover rate, workgroup processes), w = 6 or 11 (the 6 control variables or the 11 control variables), a sample size of 268 units, and a power of 0.80, the realistically observed minimum effect size is any change in $R^2$ that ranges from 0.027 (u = 1) to 0.041 (u = 4). According to Cohen, these effect sizes lie between a small effect size (0.02) and a medium effect size (0.15). Thus, the current analysis with a sample size of 268 units has enough power to capture the direct effects of the turnover as well as the mediating effects of workgroup processes.

*Empirical Model Specification*

The current study used both linear and count models, depending on the distribution of the process and outcome variables. The effect of nursing unit turnover on workgroup processes used the ordinary linear squares (OLS) model with specifications given in Equation 4.1:

$$WP_{ih} = \alpha_1 + \beta_1 TO_{ih} + \gamma_1 X_{ih} + \mu_{1h} + \varepsilon_{1ih}, \qquad (4.1)$$

where subscript *i* indexes the nursing unit and *h* indexes the hospital. $WP_{ih}$ is a set of workgroup process variables (i.e., workgroup cohesion, relational coordination, and workgroup learning). $TO_{ih}$ is the actual level of the average crude turnover rates for each period. $X_{ih}$ is a vector of work complexity, nurses' experience and education, hospital size, technology complexity, and teaching status to control alternative explanations of workgroup processes. Time invariant hospital and nursing unit heterogeneities are $\mu_h$ and $\varepsilon_{ih}$,

respectively. To deal with the potential endogeneity problem, turnover rates were measured prior to the process measures as a once-lagged variable. Using the Breusch-Pagen and Hausman tests (Greene, 2003), OLS estimators were compared to random and fixed effects estimators. The specification tests strongly suggested that the hospital-specific effects were not found; thus, a simple OLS model with robust standard errors was used to test the model of workgroup processes.

The effect of workgroup processes on patient outcomes is specified in Equation 4.2:

$$PO_{ih} = \alpha_2 + \beta_2 WP_{ih} + \gamma_2 Y_{ih} + \mu_{2h} + \varepsilon_{2ih}. \qquad (4.2)$$

After the specification tests, while the patient satisfaction model used OLS estimates, the model of average length of patient stay was estimated by using random effects. In term of the models of patient falls and medication errors, a Poisson regression model with an adjustment for overdispersion was used. The Poisson regression is a specific type of distribution in which scores take the form of a non-negative whole number or integer values (Hutchinson & Holtman, 2005). In most practical circumstances, the assumption of a true Poisson model, that the distribution of the dependent variable has a mean equal to its variance, is not satisfied. Thus, statistical corrections were incorporated in the model to account for overdispersion, which is observed variance greater than the mean. The model of patient outcomes also used the lagged information approach. $PO_{ih}$ includes patient satisfaction, average length of patient stay, patient falls, and medication errors. $Y_{ih}$ is a vector of RN hours, nursing unit size, patient age, health status, and previous hospitalization, including the control variables mentioned above.

Equations 4.3 and 4.4 were used to test the mediating effect of workgroup processes on the relationship between turnover and outcomes:

$$PO_{ih} = \alpha_3 + \beta_3 TO_{ih} + \gamma_3 Y_{ih} + \mu_{3h} + \varepsilon_{3ih} \quad (4.3)$$

$$PO_{ih} = \alpha_4 + \beta_4 TO_{ih} + \delta_4 WP_{ih} + \gamma_4 Y_{ih} + \mu_{4h} + \varepsilon_{4\text{ih}}. \quad (4.4)$$

In Equation 4.4, $WP_{ih}$ (workgroup cohesion, relational coordination, and workgroup learning) is deemed a mediating variable because it represents one of the pathways through which $TO_{ih}$ (nursing unit turnover) operates. $\beta_4$ is said to estimate the direct effect of $TO_{ih}$ (nursing unit turnover) on $PO_{ih}$ (patient satisfaction, average length of stay, patient falls, and medication errors). Nursing unit turnover also have an indirect effect on patient outcomes via workgroup processes. Thus, the total effect of nursing unit turnover on patient outcomes is $\beta_3$. If the direct effect of nursing unit turnover on patient outcomes without the mediator (workgroup processes) is reduced to zero when the mediator is present in the model, then complete mediation has occurred. Because most social phenomena have multiple causes, however, a more realistic condition to seek a mediating effect is that the significance of the association between nursing turnover and patient outcomes is reduced by adding workgroup processes variables to the model (Baron & Kenny, 1986).

To address for the potential problem of endogeneity noted above, this study used a lagged information approach in the linear and count models; however, only in true experimental designs can plausible alternative explanations for observed relationships be eliminated. In addition, the models used in this study cannot control for all aspects of the endogenity of turnover for several reasons. First, time-varying unobserved hospital

heterogeneity would still remain in the error term, which can yield biased estimates. Second, any feedback effects of patient outcomes on nursing turnover would make the estimators inconsistent with fixed time periods due to a failure of the strict exogeneity condition (Bond, 2002).

## Summary

This chapter identified the specific methodologies used in this study. This study used data from the ORNA II study. Data were prepared for analysis by being aggregated by nursing unit. Power calculations were carried out, statistical power was assessed, and the empirical model was specified. This study used both linear and nonlinear (dummy variables) forms of turnover to test negative and positive impacts of turnover. Based on the distribution of the process and outcome variables, the current study used the linear (OLS and random effects) and count (Poisson distribution) models.

# Chapter 4

# RESULTS

The purpose of this current study was to develop and test a model that integrates theory on the impact of nursing turnover on workgroup processes and how theses processes affect on patient outcomes. Specifically, this study investigated the relationship between nursing unit turnover and workgroup processes and explored the mediating effect of workgroup processes on the relationship between nursing unit turnover and unit-level patient outcomes. This chapter presents the results of the statistical analysis and reports the findings of the research hypotheses presented in Chapter2.

## Description of Study Variables

This section provides descriptive data on the means, standard deviations, observed ranges, and correlations among the nursing turnover, workgroup process, patient outcome, and control variables used in this study. As summarized in Table 7, average RN turnover rates over a two-month period ranged from 4.29% (January to February) to 4.58% (March to April). Over a six month period January-June, nursing units in this study had on average a turnover rate of 12.66 percent; turnover rates varied widely from 0 to 105.15 percent over this six-month study period (January to June). When annualized, the average crude turnover rate was about 25 percent. In terms of workgroup processes, nurses rated workgroup cohesion at 4.38 (between “agree” and “agree somewhat”). Similarly, the average score for relational coordination with all other health providers was 3.64 (between “occasionally” and

Table 7. Descriptive Statistics and Correlations for Study Variables

| | MEANS | S.D | Min. | Max. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Nursing turnover% (JAN_FEB) | 4.29 | 6.47 | 0.00 | 61.54 | | | | | | | | | |
| 2. Nursing turnover% (MAR_APR) | 4.58 | 6.43 | 0.00 | 40.00 | 0.05 | | | | | | | | |
| 3. Nursing turnover% (JAN_JUNE) | 12.66 | 12.35 | 0.00 | 105.15 | 0.59* | 0.62* | | | | | | | |
| 4. Workgroup cohesion | 4.38 | 0.45 | 3.23 | 5.50 | -0.10 | -0.21* | -0.25* | | | | | | |
| 5. Coord with other providers | 3.64 | 0.20 | 2.58 | 4.19 | -0.05 | -0.15* | -0.14* | 0.28* | | | | | |
| 6. Coord with phys and pharms | 3.70 | 0.22 | 2.61 | 4.41 | -0.02 | -0.06 | -0.05 | 0.23* | 0.81* | | | | |
| 7. Workgroup learning | 3.79 | 0.32 | 2.20 | 4.65 | -0.10 | -0.13* | -0.16* | 0.37* | 0.44* | 0.44* | | | |
| 8. Patient satisfaction | 3.43 | 0.22 | 2.62 | 4.00 | -0.03 | -0.09 | -0.13* | 0.20* | 0.15* | 0.20* | 0.06 | | |
| 9. Average length of stay | 4.51 | 1.06 | 2.23 | 8.65 | 0.13* | -0.02 | 0.09 | -0.06 | 0.11 | -0.01 | 0.04 | -0.21* | |
| 10. Patient falls | 9.52 | 6.27 | 0.00 | 35.00 | 0.10 | 0.05 | 0.06 | -0.05 | -0.05 | -0.09 | -0.07 | -0.06 | 0.14* |
| 11. Patient falls/1,000 pt days | 4.03 | 2.36 | 0.00 | 12.19 | -0.01 | 0.03 | 0.04 | -0.03 | 0.00 | -0.01 | -0.05 | -0.05 | 0.06 |
| 12. Med errors | 1.81 | 3.07 | 0.00 | 19.00 | 0.03 | -0.05 | -0.01 | -0.05 | 0.07 | 0.05 | -0.11 | 0.00 | 0.05 |
| 13. Med errors/1,000 pt days | 0.77 | 1.31 | 0.00 | 8.01 | 0.01 | -0.07 | -0.02 | -0.05 | 0.07 | 0.06 | -0.10 | 0.00 | 0.05 |
| 14. Work complexity | 3.84 | 0.49 | 2.41 | 5.34 | 0.18* | 0.18* | 0.21* | -0.18* | -0.27* | -0.29* | -0.21* | -0.21* | -0.07 |
| 15. Unit size | 33.59 | 11.46 | 13.00 | 84.00 | 0.21* | 0.10 | 0.07 | -0.07 | -0.10 | -0.13* | -0.12* | 0.03 | 0.00 |
| 16. Nurse education level | 0.37 | 0.194 | 0.00 | 1.00 | 0.01 | -0.10 | -0.04 | 0.16* | 0.08 | 0.02 | 0.14* | -0.13* | 0.12 |
| 17. Unit tenure in months | 74.39 | 32.63 | 19.44 | 199.89 | -0.13* | -0.13* | -0.20* | 0.09 | 0.03 | 0.06 | 0.12 | 0.14* | -0.13* |
| 18. RN hours (%) | 61.87 | 14.37 | 27.51 | 100.00 | 0.01 | -0.06 | -0.08 | 0.17* | 0.15* | 0.10 | 0.08 | 0.12* | -0.07 |
| 19. Hospital size | 346.55 | 188.13 | 75.00 | 1242.00 | 0.07 | -0.05 | -0.08 | 0.05 | 0.00 | 0.02 | 0.11 | -0.11 | 0.19* |
| 20. Technological sophistication | 4.62 | 1.82 | 0.08 | 8.01 | 0.07 | -0.13* | -0.09 | 0.11 | -0.11 | -0.06 | 0.01 | -0.04 | 0.03 |
| 21. Teaching hospitals | 0.13 | 0.25 | 0.00 | 1.23 | 0.12* | -0.04 | 0.04 | 0.00 | -0.02 | -0.02 | 0.08 | -0.14* | 0.11 |
| 22. Patient age | 56.76 | 7.53 | 36.71 | 78.25 | 0.05 | 0.14* | 0.12 | -0.03 | -0.04 | -0.05 | -0.21* | 0.23* | -0.03 |
| 23. Health status | 3.46 | 0.44 | 2.00 | 5.00 | -0.12* | -0.16* | -0.23* | 0.10 | 0.07 | 0.04 | 0.04 | 0.22* | -0.19* |
| 24. Previous hospitalization | 0.53 | 0.21 | 0.00 | 1.00 | 0.11 | -0.02 | 0.10 | -0.05 | 0.03 | 0.06 | 0.06 | -0.08 | 0.07 |

Table 7. (continued)

| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Nursing turnover% (JAN_FEB) | | | | | | | | | | | | | | |
| 2. Nursing turnover% (MAR_APR) | | | | | | | | | | | | | | |
| 3. Nursing turnover% (JAN_JUNE) | | | | | | | | | | | | | | |
| 4. Workgroup cohesion | | | | | | | | | | | | | | |
| 5. Coord with other providers | | | | | | | | | | | | | | |
| 6. Coord with phys and pharms | | | | | | | | | | | | | | |
| 7. Workgroup learning | | | | | | | | | | | | | | |
| 8. Patient satisfaction | | | | | | | | | | | | | | |
| 9. Average length of stay | | | | | | | | | | | | | | |
| 10. Patient falls | | | | | | | | | | | | | | |
| 11. Patient falls/1,000 pt days | 0.86* | | | | | | | | | | | | | |
| 12. Med errors | 0.27* | 0.19* | | | | | | | | | | | | |
| 13. Med errors/1,000 pt days | 0.23* | 0.20* | 0.99* | | | | | | | | | | | |
| 14. Work complexity | 0.15* | 0.01 | 0.05 | 0.02 | | | | | | | | | | |
| 15. Unit size | 0.49* | 0.10 | 0.23* | 0.14* | 0.24* | | | | | | | | | |
| 16. Nurse education level | 0.00 | -0.06 | -0.11 | -0.12 | -0.06 | -0.03 | | | | | | | | |
| 17. Unit tenure in months | -0.01 | 0.04 | 0.00 | 0.00 | -0.09 | 0.00 | 0.04 | | | | | | | |
| 18. RN hours (%) | -0.02 | 0.00 | 0.00 | 0.00 | -0.13* | -0.09 | 0.22* | 0.15* | | | | | | |
| 19. Hospital size | 0.03 | -0.14* | 0.04 | 0.00 | 0.01 | 0.15* | 0.29* | -0.01 | 0.16* | | | | | |
| 20. Technological sophistication | 0.00 | -0.14* | 0.01 | -0.01 | 0.01 | 0.10 | 0.30* | -0.03 | 0.14* | 0.65* | | | | |
| 21. Teaching hospitals | -0.03 | -0.15* | -0.03 | -0.04 | 0.05 | 0.02 | 0.30* | 0.07 | 0.22* | 0.44* | 0.41* | | | |
| 22. Patient age | 0.16* | 0.15* | 0.05 | 0.05 | 0.10 | 0.12 | -0.12* | 0.02 | 0.04 | -0.17* | -0.09 | -0.26* | | |
| 23. Health status | -0.14* | -0.19* | 0.02 | 0.00 | -0.04 | 0.05 | 0.04 | 0.03 | 0.04 | 0.04 | 0.01 | -0.05 | -0.07 | |
| 24. Previous hospitalization | 0.02 | 0.01 | 0.07 | 0.07 | -0.02 | -0.01 | -0.04 | 0.01 | 0.08 | 0.05 | 0.09 | 0.01 | 0.06 | -0.38* |

Note: N = 268, * Correlations are significant at the .05 level.

"often") and 3.70 (between "occasionally" and "often") for relational coordination with physicians and pharmacists. On average, nurses rated workgroup learning at 3.79 (between "no opinion" and "agree"). Patients rated the nursing care they received as good to excellent. Patient age ranged from 37-78, with an average age of fifty seven years. On average, patients rated their health status as fair to good. Of the patients who participated in this study, 53 % experienced hospitalizations in the past year. The average length of stay was 4.5 days (ranging from 2.2 to 8.7 days) for the three-month period April-June. Nursing units experienced 4.03 patient falls per 1,000 patient days (ranging from 0 to 12.19 falls) over the same period. They reported 0.77 severe medication errors per 1,000 patient days, ranging from 0 to 8 errors.

On average, 62% of nursing care hours was delivered by RNs (ranging from 23 to 100%). The nursing units employed 37% BSN-prepared RN staff (over a range of 0 to 100 percent of BSN). The average unit tenure in this study was 74.39 months (over a range of 19 to 200 months), which is equal to 6.2 years (ranging from 1.6 to 16.7 years). In terms of hospital characteristics, the average hospital size was 347 beds (ranging from 75 to 1,242 beds). On average, the hospitals had 0.13 medical and dental residents per hospital maintained bed. In addition, nurses rated work complexity at 3.84 on average, which is between disagree slightly and agree slightly, and nursing unit size averaged 34 beds (ranging from 13 to 84 beds).

Table 7 also presents Pearson correlation coefficients among the study variables. The average nursing unit turnover rate between January and February was correlated with the average length of patient stay ($r = 0.13$), work complexity ($r = 0.18$), nurse unit tenure ($r = -0.13$), teaching status ($r = 0.12$), unit size ($r = 0.21$), and patient health status ($r = -0.12$).

Additionally, the RN turnover rate during March and April was correlated with more variables, including workgroup cohesion (r = -21), coordination with other health providers (r = -0.15), work complexity (r = 0.18), nurse unit tenure (r = -0.13), technological sophistication (r = -0.13), patient age (r = 0.14), and patient health status (r = -0.16).

## Results of Final Models

The results of the 17 hypotheses outlined in Chapter 2, which are consistent with ten main effects and seven mediating effects, and other findings related to the control variables are summarized in this section. The current study used both linear and count models based on the distribution of the process and outcome variables. Statistical tests were used to compare estimators among ordinary least squares (OLS), random effects, and fixed effects models. The Breusch-Pagan and Hausman tests (Greene, 2003) strongly suggested that the hospital-specific effects did not exist so that a simple OLS model with robust standard errors was used to test the model of workgroup processes. Similarly, an OLS model was employed to examine the model of patient satisfaction. The model of average length of patient stay used random effects models. Finally, a Poisson regression model with adjustment for overdispersion was used to assess the models of patient falls and medication errors.

### Effects of Nursing Unit Turnover on Workgroup Processes

*Hypothesis 1a (H1a)*: Higher nursing turnover in nursing units will be related to lower workgroup cohesion.

*Hypothesis 1b (H1b)*: Higher nursing unit turnover will be associated with lower workgroup relational coordination.

*Hypothesis 1c (H1c)*: Relative to nursing units with high or low levels of turnover among RNs, nursing units with moderate levels of turnover will experience greater workgroup learning.

The regression results of Hypotheses 1a, 1b, and 1c are summarized in Table 8, which presents the findings of the effects of nursing unit turnover on workgroup processes (workgroup cohesion, relational coordination, and workgroup learning). The relationship between the workgroup process variables and nursing turnover was not significant (workgroup cohesion: $\beta$ = -0.008, p = 0.091; relational coordination with other healthcare providers: $\beta$ = -0.003, p = 0.084). Relational coordination with physicians and pharmacists was not significantly associated with nursing unit turnover. In terms of the turnover-learning relationship, the results suggest that nursing units with greater than 3.2% to 4.5% of turnover are likely to have lower levels of workgroup learning, by 0.179 points, than nursing units with 0% turnover. However, this study did not find any significant difference in workgroup learning between the reference group (0% turnover) and other turnover groups. Therefore, Hypotheses 1a through 1c were not supported in this study.

The seven variables including work complexity, unit size, nurse education level, unit tenure, hospital size, technological sophistication, and teaching hospitals were used to control unit characteristics, nurse characteristics, and hospital characteristics in each model of workgroup processes. Although no specific hypotheses were related to these variables, the results of the control variables are summarized in Table 8. Among the nursing unit control variables, that is, work complexity consistently showed a significant negative beta coefficient in the workgroup process models. Nurse education level was positively associated

Table 8. Effects of Nursing Unit Turnover on Workgroup Processes

| | Workgroup cohesion | Relational coordination with other health care providers | Relational coordination with physicians and pharmacists | Workgroup learning |
|---|---|---|---|---|
| | H1a | H1b | | H1c |
| Nursing unit turnover (JAN_FEB) | | -0.003 | -0.001 | |
| | | (0.002) | (0.002) | |
| Nursing unit turnover (MAR_APR) | -0.008 | | | |
| | (0.005) | | | |
| Turnover JAN_FEB = 0% (reference group) | | | | |
| 0 < Turnover JAN_FEB ≤ 3.2% | | | | -0.077 |
| | | | | (0.058) |
| 3.2 < Turnover JAN_FEB ≤ 4.5% | | | | -0.179** |
| | | | | (0.060) |
| 4.5 < Turnover JAN_FEB ≤ 7.4 | | | | -0.056 |
| | | | | (0.051) |
| 7.4 < Turnover JAN_FEB | | | | -0.059 |
| | | | | (0.047) |
| *Control variables* | | | | |
| Work complexity | -0.150* | -0.112** | -0.135** | -0.124** |
| | (0.062) | (0.030) | (0.032) | (0.047) |
| Unit size | -0.000 | 0.001 | 0.000 | 0.001 |
| | (0.002) | (0.001) | (0.001) | (0.002) |
| Nurse education level | 0.336* | 0.086 | 0.019 | 0.098 |
| | (0.147) | (0.069) | (0.075) | (0.130) |
| Unit tenure | 0.001 | 0.000 | 0.000 | 0.002** |
| | (0.001) | (0.000) | (0.000) | (0.001) |
| Hospital size | 0.000 | 0.000 | 0.000 | 0.000* |
| | 0.000 | (0.000) | (0.000) | (0.000) |
| Technological sophistication | 0.022 | -0.018 | -0.008 | -0.019 |
| | 0.020 | (0.010) | (0.010) | (0.014) |
| Teaching hospitals | -0.111 | -0.074 | -0.137* | 0.045 |
| | (0.116) | (0.058) | (0.068) | (0.107) |
| Constant | 4.702** | 4.105** | 4.231** | 4.150*** |
| | (0.250) | (0.128) | (0.135) | (0.196) |
| R - squared | 0.103 | 0.136 | 0.143 | 0.123 |
| F value | 3.25** | 4.70** | 4.47** | 3.25** |

Note: N = 268, *significant at .05; **significant at .01. Standard errors in parentheses

with workgroup cohesion. Nurse unit tenure showed a positive impact on workgroup learning. The negative beta coefficient on teaching hospitals was found in the model of relational coordination with physicians and pharmacists. The major finding related to control variables was that nursing units with more work complexity had lower levels of workgroup processes.

**Effects of Workgroup Processes on Patient Outcomes**

*Hypothesis 2a (H2a)*: Lower nursing unit cohesion will be associated with lower levels of patient satisfaction.

*Hypothesis 2b (H2b)*: Lower levels of relational coordination between nurses and other care providers will be associated with lower levels of patient satisfaction.

*Hypothesis 2c (H2c)*: Lower relational coordination between nurses and other health care providers will be associated with longer average length of patient stay.

*Hypothesis 2d (H2d)*: Lower levels of relational coordination between nurses and other health care providers will be associated with increased patient falls.

*Hypothesis 2e (H2e)*: Nursing units with lower levels of workgroup learning will be associated with higher levels of patient falls.

*Hypothesis 2f (H2f)*: Lower levels of relational coordination among nurses, physicians, and pharmacist will be associated with higher levels of medication errors.

*Hypothesis 2g (H2g)*: Lower workgroup learning is associated with a higher incidence of medication errors.

Tables 9 and 10 summarize the effects of workgroup processes on patient outcomes. As noted earlier, while the patient satisfaction model used the OLS regression with robust standard errors, the final model of the average length of patient stay was the random effects model that considers hospital clusters. A Poisson distribution that adjusts for overdispersion was used to test the patient fall and medication error models.

Workgroup cohesion ($\beta$ = 0.091, p = 0.001) and relational coordination with other health care providers ($\beta$ = 0.159, p = 0.027) were significantly associated with patient satisfaction (Table 9). These results supported hypothesized positive relationships between workgroup processes and patient satisfaction. In the model of patient satisfaction with both workgroup cohesion and relational coordination, relational coordination becomes insignificant. Because it implies a possible mediating effect of workgroup cohesion in the impact of relational coordination on patient satisfaction, an additional analysis was conducted to assess the impact of relational coordination on workgroup cohesion. A significant impact of relational coordination on workgroup cohesion was found ($\beta$ = 0.586, p < 0.001). The results suggest that relational coordination and workgroup cohesion have a positive impact on patient satisfaction. Additionally, relational coordination has a positive indirect impact on patient satisfaction through workgroup cohesion.

In terms of control variables, work complexity and nurse education level were negatively related to patient satisfaction, while the results showed that patient satisfaction was positively associated with patient age and patient health status. The random effects model of lengths of stay (H2c) revealed that relational coordination with other health care providers was not associated with average length of stay. Additionally, this model found that patient health status had negative impacts on length of stay. Other things being equal, an

Table 9. Effects of Workgroup Processes on Patient Satisfaction and Average Length of Patient Stay

| | Patient satisfaction | | | Average length of patient stay |
|---|---|---|---|---|
| | H2a | H2b | H2a, H2b | H2c |
| Workgroup cohesion | 0.091** | | 0.078** | |
| | (0.028) | | (0.028) | |
| Relational coordination with other health care providers | | 0.159** (0.071) | 0.113 (0.071) | 0.507 (0.320) |
| *Control variables* | | | | |
| Work complexity | -0.079** | -0.075* | -0.068* | -0.109 |
| | (0.028) | (0.029) | (0.028) | (0.132) |
| Unit size | 0.002 | 0.002 | 0.002 | -0.010 |
| | (0.001) | (0.001) | (0.001) | (0.006) |
| Nurse education level | -0.178* | -0.160* | -0.181* | 0.252 |
| | (0.074) | (0.074) | (0.073) | (0.345) |
| Unit tenure | 0.001 | 0.001 | 0.001 | -0.002 |
| | (0.000) | (0.000) | (0.000) | (0.002) |
| RN hours | 0.002 | 0.002 | 0.002 | -0.009 |
| | (0.001) | (0.001) | (0.001) | (0.005) |
| Hospital size | -0.000 | -0.000 | -0.000 | 0.002** |
| | (0.000) | (0.000) | (0.000) | (0.001) |
| Technological sophistication | 0.010 | 0.015 | 0.012 | -0.065 |
| | (0.010) | (0.009) | (0.010) | (0.053) |
| Teaching status | -0.047 | -0.042 | -0.037 | -0.311 |
| | (0.061) | (0.063) | (0.061) | (0.333) |
| Patient age | 0.006** | 0.006** | 0.006** | 0.002 |
| | (0.002) | (0.002) | (0.002) | (0.009) |
| Health status | 0.077* | 0.081** | 0.076* | -0.470** |
| | (0.031) | (0.031) | (0.030) | (0.144) |
| Previous Hospitalization | -0.024 | -0.034 | -0.028 | 0.029 |
| | (0.070) | (0.072) | (0.070) | (0.308) |
| Constant | 2.629** | 2.382** | 2.230** | 5.153** |
| | (0.245) | (0.358) | (0.355) | (1.602) |
| R – squared | 0.233 | 0.221 | 0.242 | |
| F value/Wald chi –squared | 6.27** | 6.17** | 6.15** | 40.08** |

Note: N = 268, *significant at .05; **significant at .01. Standard errors in parentheses

Table 10. Effects of Workgroup Processes on Patient Falls and Medication Errors

| | Patient falls | Patient falls (Incident rate) | Medication errors | Medication errors (Incident rate) |
|---|---|---|---|---|
| | H2d, H2e | | H2f, H2g | |
| Relational coordination with other health care providers | -0.068<br>(0.187) | 0.934 | | |
| Relational coordination with physicians and pharmacists | | | 0.873*<br>(0.411) | 2.395* |
| Workgroup learning | -0.026<br>(0.113) | 0.974 | -0.581*<br>(0.295) | 0.560* |
| *Control variables* | | | | |
| Work complexity | -0.048<br>(0.069) | 0.953 | -0.133<br>(0.160) | 0.876 |
| Unit size | 0.004<br>(0.003) | 1.003 | 0.008<br>(0.006) | 1.008 |
| Nurse education level | 0.155<br>(0.170) | 1.168 | -1.239**<br>(0.430) | 0.290** |
| Unit tenure | 0.000<br>(0.001) | 1.000 | 0.003<br>(0.002) | 1.003 |
| RN hours | 0.002<br>(0.002) | 1.002 | 0.006<br>(0.005) | 1.006 |
| Hospital size | -0.000<br>(0.000) | 1.000 | -0.001<br>(0.001) | 0.999 |
| Technological sophistication | -0.009<br>(0.023) | 0.991 | 0.045<br>(0.055) | 1.046 |
| Teaching status | -0.378*<br>(0.163) | 0.686* | -0.336<br>(0.416) | 0.715 |
| Patient age | 0.005<br>(0.005) | 1.005 | -0.011<br>(0.010) | 0.989 |
| Health status | -0.228**<br>(0.076) | 0.796** | 0.105<br>(0.174) | 1.111 |
| Previous Hospitalization | -0.035<br>(0.165) | 0.966 | 0.443<br>(0.373) | 1.557 |
| Constant | 2.228**<br>(0.842) | | -1.115<br>(1.909) | |

Note: N = 268, *significant at .05; **significant at .01. Standard errors in parentheses

increase in patient health status led to a decrease in average length of patient stay by 0.470 days. Hospital size was positively associated with average length of stay. Therefore, Hypotheses 2a and 2b were supported, but Hypothesis 2c was not supported in this study.

Hypotheses 2d through 2g focused on the effect of workgroup processes on patient safety outcomes. In Chapter 2, workgroup processes variables (relational coordination with other health care providers, relational coordination with physicians and pharmacists, and workgroup learning) were hypothesized to affect patient safety. Relational coordination with physicians and pharmacists ($\beta$ = 0.873, p = 0.033) and workgroup learning ($\beta$ = -0.580, p = 0.026) were significantly associated with medication errors, but these workgroup process variables were not found to be associated with patient falls. In the model of medication errors, an increase in workgroup learning led to 0.560 times as many medication errors, which supports the hypothesis. For example, a nursing unit that experienced one medication error per 1,000 patient days would experience 0.560 medication errors per 1,000 patient days when workgroup learning increased by one point, which is a 44 percent decrease in medication errors (1-0.56 = 0.44). The direction of the relationship between relational coordination with physicians and pharmacists was positive, the opposite of this study's expectations. The results suggested that, other things being equal, a point increase in relational coordination with physicians and pharmacists led to 2.395 times as many medication errors.

In terms of control variables, this study found a significant negative beta coefficient on teaching hospitals in the patient fall model ($\beta$ = -0.378, p = 0.21). In other words, a nursing unit in a hospital that had more medical and dental residents was less likely to have patient falls than a nursing unit in a hospital that had fewer residents. Other things being

equal, a one-resident increase per maintained bed led to a decrease in patient falls by 0.686 times. For example, a nursing unit that experienced one patient fall per 1,000 patient days would experience 0.686 patient falls per 1,000 patient days when the number of residents increased by one person. In other words, a one person increase in the number of residents led to a 31.4 percent decrease in patient falls (1-0.686 = 0.314). Similarly, patient health status was negatively associated with patient falls ($\beta$ = -0.228, p = 0.003). The model suggested that a nursing unit having one patient fall per 1,000 patient days would experience 0.796 patient falls when the unit experienced a one-point increase in patient health status. The results of the medication error models suggested that nurse education was the only variable with a negative impact on medication errors ($\beta$ = -1.239, p = 0.004). An increase in BSN-prepared RN staff proportion of one percentage point led to a decrease in medication errors per 1,000 patient days by 0.290 times. In other words, when the BSN-prepared RN staff proportion increased by one percentage point, a unit that experienced two medication errors per 1,000 patient days would experience 0.58 (0.29×2) medication errors per 1,000 patient days, which is equal to a 71 percent decrease in medication errors. Therefore, Hypothesis g was supported, but 2d, 2e, and 2f were not supported in this study.

**Mediating Effects of Workgroup Processes on the Relationship between Nursing Turnover and Patient Outcomes**

*Hypothesis 3a (H3a)*: Nursing unit cohesion will mediate the effect of nursing unit turnover on patient satisfaction.

*Hypothesis 3b (H3b)*: Relational coordination of nurses with other health care providers will mediate the effect of nursing unit turnover on patient satisfaction.

*Hypothesis 3c (H3c)*: Relational coordination of nurses with other health care providers will mediate the effect of nursing unit turnover on average length of patient stay.

*Hypothesis 3d (H3d)*: Relational coordination of nurses with other health care providers will mediate the effect of nursing unit turnover on patient falls.

*Hypothesis 3e (H3e)*: Workgroup learning will mediate the effect of nursing unit turnover on patient falls.

*Hypothesis 3f (H3f)*: Relational coordination of nurses with physicians will mediate the effect of nursing unit turnover on the incidence of medication errors.

*Hypothesis 3g (H3g)*: Workgroup learning will mediate the effect of nursing unit turnover on the incidence of medication errors.

Above, higher nursing unit turnover rates were hypothesized to lead to lower levels of patient satisfaction through the mediating effects of workgroup cohesion and relational coordination. High levels of nursing unit turnover were expected to show an association with longer average length of stay by reducing relational coordination between staff nurses and other health care providers. Similarly, nursing unit turnover was expected to affect patient safety through the negative impact of nursing turnover on relational coordination and workgroup learning. Theses mediation hypotheses require the testing of three equations: (1) the effects of nursing unit turnover on patient outcomes, (2) the combined effects of nursing unit turnover and workgroup processes on patient outcomes, and (3) the effects of nursing unit turnover on workgroup processes. To show mediation, all of these effects must be significant, and the significance of the associations between nursing turnover and patient outcomes must be reduced by adding workgroup processes to the model (Baron & Kenny,

1986).

The effects of nursing unit turnover on patient outcome and care efficiency are shown in Tables 11 and 12. Nursing unit turnover during both January to February and March to April were not associated with patient satisfaction. The relationship between turnover and length of stay was not significant ( $\beta$ = 0.018, p = 0.071). This study found a significant difference in patient falls between nursing units with low levels of turnover (greater than 0% to 3.2%) and those with 0% turnover; however, other turnover groups had no differences in patient falls. Medication error variables were not related to nursing unit turnover.

Nursing units with the turnover rates greater than 0% to 3.2% during January and February were likely to have 0.743 times as many patient falls than nursing units with 0% turnover ( $\beta$ = -0.297, p = 0.021). This finding suggests that low levels of nursing unit turnover may be beneficial in the prevention of patient falls, though this study did not find a positive effect of turnover on workgroup learning.

To complete the mediation argument, nursing unit turnover must be shown to be associated with decreased workgroup processes. As reviewed earlier (Table 8), nursing unit turnover was not associated with workgroup cohesion, relational coordination, and patient satisfaction. Thus, Hypotheses H3a and H3b were not supported in this study. Similarly, Hypothesis H3c was not supported in this study because nursing unit turnover and relational coordination with other health care providers were not related to average length of stay (Tables 9 and 11). In terms of the models of patient falls, Hypotheses H3d and H3e were not supported because nursing unit turnover and workgroup processes were not associated with patient falls (Tables 10 and 12). In the model of medication errors, Hypotheses H3f and H3g were not supported because nursing unit turnover was not associated with medication errors.

Table 11. Effects of Nursing Unit Turnover on Patient Satisfaction and Average Length of Patient Stay

| | Patient Satisfaction | | Average length of patient stay |
|---|---|---|---|
| Nursing unit turnover (JAN_FEB) | | -0.001 | 0.018 |
| | | (0.002) | (0.010) |
| Nursing unit turnover (MAR_APR) | -0.003 | | |
| | (0.002) | | |
| *Control variables* | | | |
| Work complexity | -0.089** | -0.090** | -0.205 |
| | (0.029) | (0.030) | (0.129) |
| Unit size | 0.002 | 0.002 | -0.011 |
| | (0.001) | (0.001) | (0.006) |
| Nurse education level | -0.152* | -0.146 | 0.213 |
| | (0.077) | (0.077) | (0.346) |
| Unit tenure | 0.001 | 0.001 | -0.001 |
| | (0.000) | (0.000) | (0.002) |
| RN hours | 0.002* | 0.002* | -0.009 |
| | (0.001) | (0.001) | (0.005) |
| Hospital size | -0.000 | -0.000 | 0.002** |
| | (0.000) | (0.000) | (0.000) |
| Technological sophistication | 0.011 | 0.012 | -0.067 |
| | (0.266) | (0.009) | (0.053) |
| Teaching status | -0.056 | -0.055 | -0.405 |
| | (0.063) | (0.064) | (0.331) |
| Patient age | 0.006** | 0.005** | 0.001 |
| | (0.002) | (0.002) | (0.009) |
| Health status | 0.077* | 0.084** | -0.429** |
| | (0.031) | (0.031) | (0.144) |
| Previous Hospitalization | -0.036 | -0.027 | 0.012 |
| | (0.072) | (0.072) | (0.308) |
| Constant | 3.053** | 3.012** | 7.275** |
| | (0.210) | (0.215) | (0.975) |
| R – squared | 0.209 | 0.204 | |
| F value/Wald chi -squared | 5.64** | 5.58** | 40.95** |

Note: N = 268, *significant at .05; **significant at .01. Standard errors in parentheses

Table 12. Effects of Nursing Unit Turnover on Patient Falls and Medication Errors

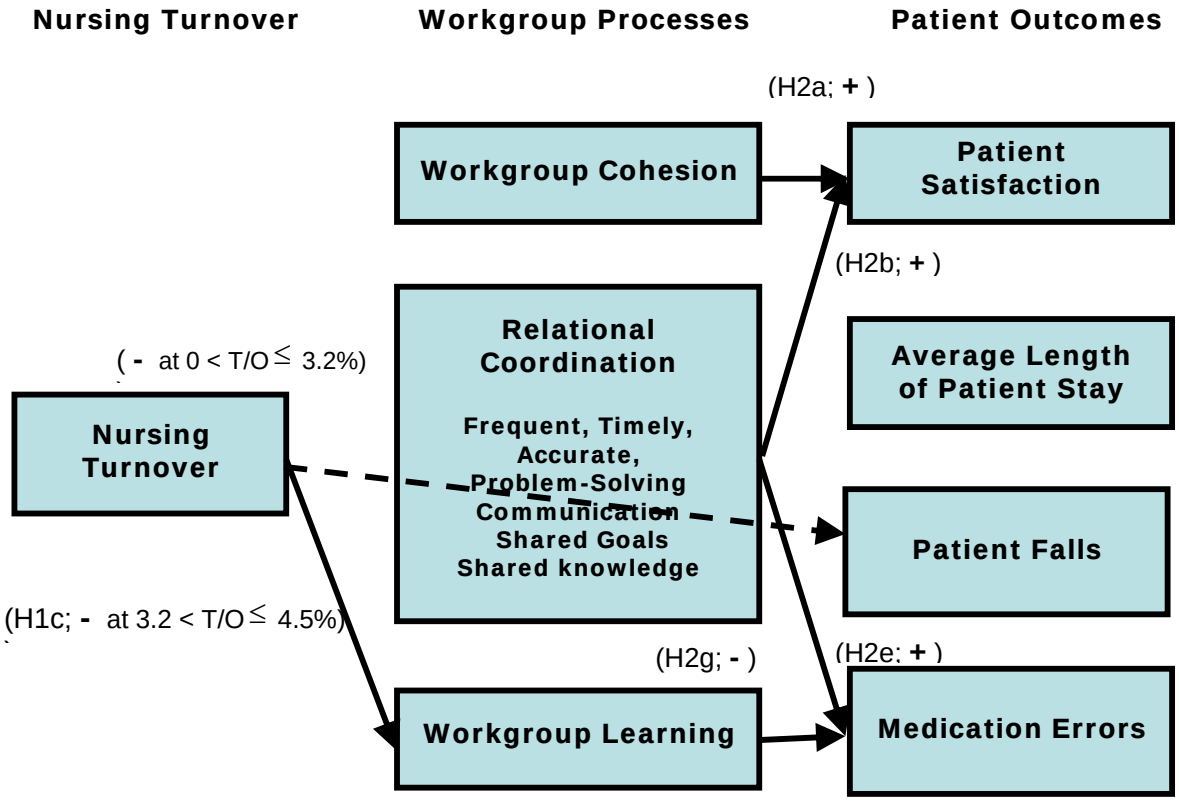
| | Patient falls | Patient falls (Incident rate) | Medication errors | Medication errors (Incident rate) |
|---|---|---|---|---|
| Turnover JAN_FEB = 0% (reference group) | | | | |
| 0 < Turnover JAN_FEB ≤ 3.2% | -0.297* | 0.743* | -0.087 | 0.917 |
| | (0.129) | | (0.284) | |
| 3.2 < Turnover JAN_FEB ≤ 4.5% | -0.002 | 0.999 | -0.208 | 0.812 |
| | (0.112) | | (0.278) | |
| 4.5 < Turnover JAN_FEB ≤ 7.4 | -0.084 | 0.919 | 0.100 | 1.106 |
| | (0.088) | | (0.194) | |
| 7.4 < Turnover JAN_FEB | -0.100 | 0.905 | -0.085 | 0.918 |
| | (0.088) | | (0.204) | |
| *Control variables* | | | | |
| Work complexity | -0.045 | 0.956 | -0.165 | 0.848 |
| | (0.068) | | (0.158) | |
| Unit size | 0.006 | 1.006 | 0.008 | 1.008 |
| | (0.003) | | (0.007) | |
| Nurse education level | 0.166 | 1.180 | -1.370* | 0.254* |
| | (0.170) | | (0.424) | |
| Unit tenure | 0.000 | 1.000 | 0.003 | 1.003 |
| | (0.001) | | (0.002) | |
| RN hours | 0.002 | 0.926 | 0.006 | 1.006 |
| | (0.002) | | (0.005) | |
| Hospital size | -0.000 | 1.000 | -0.001 | 0.999 |
| | (0.000) | | (0.001) | |
| Technological sophistication | 0.007 | 0.993 | 0.055 | 1.057 |
| | (0.023) | | (0.055) | |
| Teaching status | -0.346* | 0.707* | -0.429 | 0.630 |
| | (0.162) | | (0.407) | |
| Patient age | 0.006 | 1.006 | -0.008 | 0.992 |
| | (0.005) | | (0.010) | |
| Health status | -0.244** | 0.784** | 0.127 | 1.135 |
| | (0.076) | | (0.176) | |
| Previous Hospitalization | -0.077 | 0.926 | 0.486 | 1.625 |
| | (0.167) | | (0.381) | |
| Constant | 1.906* | | 0.168 | |
| | (0.560) | | (1.141) | |

Note: N = 268, *significant at .05; **significant at .01. Standard errors in parentheses

## Summary

This chapter described the results of the final model. Figure 4 provides a summary of the results for all the hypotheses tested in this study. The solid arrows indicate the significant results found in this study, and the dashed arrow indicates the direct effect of nursing unit turnover on patient falls at low levels of turnover. In the workgroup cohesion and relational coordination models, this study did not find significant impacts of nursing unit turnover on workgroup processes. The findings in the workgroup learning model suggest that nursing units with moderate levels of turnover rates (greater than 3.2% to 4.5 %) were likely to have lower levels of workgroup learning than nursing units with 0% turnover (reference group). However, this study did not find any difference in workgroup learning between the reference group and other turnover groups. Therefore, this study did not support Hypotheses 1a through 1c. In terms of the patient satisfaction model, the findings suggest that patient satisfaction may be positively affected by workgroup cohesion and relational coordination with other health care providers. The results of the average length of stay model did not find an impact of nursing unit turnover on average lengths of patient stays. This study found significant relationships between workgroup processes and medication errors, but not patient falls. While an increase in workgroup learning led to a decrease in medication errors, increased relational coordination with physicians and pharmacists was associated with increased medication errors. Nursing unit turnover was related to patient falls, but not to medication errors. Nursing units with low levels of turnover (greater than 0% to 3.2%) were likely to have lower levels of patient falls than nursing units with 0% turnover. This finding suggests that nursing units with this level of turnover have a better ability to prevent patient falls than those with 0% turnover, indicating a positive impact of turnover

**Figure 4. Summary of Significant Relationships**



on the prevention of patient falls. Finally, study findings did not support any mediating effects of workgroup processes on the relationships between nursing unit turnover and patient outcomes. The next chapter will discuss the results of the analyses presented in this chapter with implications of the findings for policy and practice. Also included are recommendations for future research and a discussion of the limitations of the current study.

# Chapter 5

## DISCUSSION

The purpose of this study was to examine the impact of nursing unit turnover on workgroup processes and patient outcomes. Workgroup processes examined in this study encompass workgroup cohesion, relational coordination, and workgroup learning. Patient outcomes included patient satisfaction, average length of patient stay, patient falls, and medication errors. The literature on turnover is the basis of the investigation, which suggest a potential mediating effect of workgroup processes on the relationship between nursing unit turnover and unit-level patient outcomes. Specifically, this study explored whether workgroup cohesion and relational coordination mediated the hypothesized relationships between nursing unit turnover and patient satisfaction and whether relational coordination had a mediating effect on the relationship between turnover and length of patient stay. The study also assessed the mediating effects of relational coordination and workgroup learning on the impact of turnover on patient falls and medication errors.

This chapter discusses the findings presented in the previous chapter. It begins with a discussion of the results of testing hypotheses, followed by theoretical, policy, and practical implications of the findings. It then explains the study's limitation before closing with suggestions for future research.

## Hypotheses Testing

The following section discusses the results for each hypothesis.

### Effects of Nursing Unit Turnover on Workgroup Processes

Hypotheses 1a and 1b, which assert that higher nursing unit turnover would lead to lower levels of workgroup cohesion and relational coordination, were not supported. The hypothesized nonlinear relationship between nursing turnover and workgroup learning was not supported (H1c). These findings are not consistent with the findings of earlier turnover studies (Bluedorn, 1982; Mobley, 1982; Price, 1977; Staw, 1980).

#### *Workgroup Cohesion*

Workgroup cohesion was measured as nurses' perceptions of nursing unit cohesion. Under conditions of high nursing unit turnover, turnover behaviors may cause disruption among the membership boundary. Furthermore, with high turnover, interpersonal interactions such as friendships are not easily formed (Price, 1977). When nursing turnover increases, the remaining members in the group may see their own fates as less desirable. Turnover may stimulate additional turnover and lead to salient alternative memberships (Staw, 1980). Nonetheless, the result of Hypothesis 1a did not support a relationship between nursing unit turnover and workgroup cohesion. One possible reason could be associated with study design. Post-hoc analysis revealed a significant difference in the average number of RNs between nursing units with low levels of turnover and other turnover groups. This implies that nursing units reporting higher turnover rates are likely to have fewer RNs. Based on this information, one possible scenario may be that a nursing unit experienced higher levels of turnover during the two-month study period. When workgroup

cohesion was measured, few of the RNs remained and most of the RNs were newcomers. Thus, the measured workgroup cohesion did not reflect remaining RNs' perceptions about their group's workgroup cohesion. Because ORNA II data did not have information about newcomers, it was not able to articulate the number of remaining RNs and newcomers. Another explanation is associated with turnover measurement. Turnover rates for the two-month period in this study were likely to be 0%, and there are about half the nursing units reported 0% turnover during this period. Researchers suggested that turnover should be measured over a reasonable time span, at least several months if not a full year, to be realistically annualized (McConnell, 1999). To keep the measurement order of the turnover-process-outcome, this study used turnover information for only the two-month period, which might not provide sufficient levels of turnover and enough variations in turnover rates. In turn, this study may fail to represent the overall nursing unit turnover patterns for each nursing unit. For this reason, this study did not find a significant impact of turnover on workgroup cohesion.

*Relational Coordination*

In terms of relational coordination, research suggests that increased turnover would lead to communication breakdowns and fragmented coordination (Bluedorn, 1982; Price, 1977). Relational coordination is a form of non-programmed coordination, which is a spontaneous form of coordination by informal communication and awareness of relationships among participants in work processes, and it is required when members have high levels of interdependence (Gittell, 2000). When nursing unit turnover increases, newcomer RNs can challenge the stable nursing unit structure. They are confronted by an ambiguous social and

work context. In such conditions, although they want to fit well and learn the work, they need time to assimilate workgroup norms, expectations, and communication pattern. Furthermore, remaining nurses need to be aware when they work with newcomers to monitor carefully their performance, which may hinder the development of non-programmed coordination. However, the result of Hypothesis 1b did not support a negative impact of nursing unit turnover on relational coordination. As mentioned earlier, this could be explained by study design and issues with the measurement of nursing unit turnover. In other words, because this study did not have information about newcomers and remaining, the measure of relational coordination may not represent the perception of remaining RNs regarding relational coordination. The two-month period to measure nursing turnover may not be sufficient to capture the turnover patterns of nursing units.

*Workgroup Learning*

Workgroup learning is defined as relatively permanent changes in workgroup knowledge (Kozlowski et al., 2003). When workgroup members leave, turnover itself may harm organizational memory because personal experiences and the lessons of history are lost such that knowledge disappears (Carley, 1992; Huber, 1991). For example, Argote et al. (1995) found that groups without turnover produced significantly more products than groups with turnover, and differences in productivity were amplified as groups gained experience. Although departures contribute to workgroup memory loss, the inflow of newcomers could promote workgroup learning. Learning requires both change and stability between learners and their environments, and the process of learning involves creation and manipulation of tension between constancy and change (Cangelosi & Dill, 1965; Hedberg, 1981). Thus,

turnover and the inflow of new workgroup members may be a primary source of stress, which is necessary for learning to occur.

To test the nonlinear relationship between turnover and workgroup learning, the dummy variables of turnover were used. This study did not find any positive effect of nursing turnover on workgroup processes, and a negative impact of turnover was partially supported. Compared to the reference group (0% turnover), nursing units with moderate levels of turnover (greater than 3.2% to 4.5%) were likely to have decreased workgroup learning. However, other turnover groups, including low (greater than 0 to 3.2%), high (greater than 4.5% to 7.4%), and very high (greater than 7.4%), did not show any differences in workgroup learning compared to the reference group. This finding suggests that low levels of turnover may not be harmful to workgroup learning. The negative impact of turnover on workgroup learning at moderate levels of turnover could be explained as follows. Nursing units with moderate levels of turnover may have an instable structure compared to nursing units with 0% turnover. Thus, this level of turnover can be dysfunctional. The reason why this study did not find the negative impact of nursing turnover on workgroup processes at high levels of turnover may be related to study design, as discussed previously.

*Control Variables*

One interesting finding of the models of workgroup processes is the negative impact of workgroup complexity on workgroup processes (workgroup cohesion, relational coordination, and workgroup learning). Work complexity encompasses such work conditions as high information load, information diversity, and rate of information change (Campbell, 1988). Previous studies suggest that work complexity negatively affects

workgroup dynamics (Argote et al., 1995; Argote, 1982; Gittell, 2002; Lott & Lott, 1965). This study measured workgroup complexity as nurses' perceptions about frequent interruptions or the frequency of unanticipated events. Under conditions of high complexity, nurses may care for more patients, feel increased work stress, deal with additional tasks, and perform several tasks at once. These issues can lead to ineffective workgroup dynamics. Additionally, an investigation of how the relationship between turnover and workgroup processes changes depending on levels of work complexity might be valuable. Under less complex working conditions, turnover may simply involve replacing an employee with few consequences for workgroup processes and outcomes. Nursing units with higher work complexity, however, may experience a decrease in the effectiveness of workgroup processes as a result of increased turnover because a member's departure constitutes a loss of social capital in such workgroups.

**Effects of Workgroup Processes on Patient Outcomes**

The results of Hypotheses 2a and 2b indicate that nursing units with better workgroup cohesion and relational coordination have greater patient satisfaction, findings which are consistent with those of previous studies (Johansson et al., 2002; Leiter et al., 1998; Meterko et al., 2004). While Hypothesis 2g, which expects a negative relationship between workgroup learning and medication errors, was supported, which is consistent with findings of previous research (Hofmann & Mark, 2006). The result for Hypothesis 2e was the opposite of what was expected. Hypotheses 2c, 2d, and 2f, which suggested that nursing units with better relational coordination and workgroup learning would have shorter lengths of stay and fewer patient falls, were not supported.

*Patient Satisfaction*

Patient satisfaction as an indicator of nursing care quality has been proposed by many researchers (Eriksen, 1995; Ervin, 2006; Vuori, 1991). Patient satisfaction is the degree of convergence between patients' expectations of ideal care and their perceptions of the care that they actually receive (Risser, 1975). Affective aspects of nursing care have been examined in relation to patient satisfaction (Chang et al., 2006). In a study by Taylor et al. (1991), the importance of affective aspects of nursing such as caring and compassion were emphasized by patients responding to question asking what quality nursing care is. In relation to cohesion, Meterko et al. (2004) found that high levels of cohesion among employees would strengthen employee motivation to provide excellent services, thus leading to high levels of patient satisfaction. In highly cohesive workgroups, less energy is required to maintain within-workgroup relationships, and more energy can devoted toward workgroup performance (Deeter-Schmelz & Kennedy, 2003). Similarly, coordination has been shown to improve both the quality and efficiency of performance in health care settings (Fargason & Haddock, 1992). Improved patient satisfaction with overall care was significantly associated with higher relational coordination among care providers (Gittell et al., 2000). Clear communication and information has been found to affect patients' perceptions of satisfaction with nursing care (Cleary & McNeil, 1988; Ottosson et al., 1997). Additionally, nursing units with good relationships between doctors and nurses were found to have higher levels of patient satisfaction (Vahey et al., 2004) . Therefore, the results of this study are consistent with findings from the previous studies. Additionally, this study found an indirect effect of relational coordination on patient satisfaction through workgroup cohesion. Considering the time sequences of these variables, this result implies a possible scenario as follows.

Increased relational coordination with other health care providers in March led to greater workgroup cohesion in May. In turn, this led to higher levels of patient satisfaction in June.

In terms of control variables, older patients with better health status reported that they were more satisfied with nursing care, supporting the conclusions of previous studies (Elder et al., 2004; Ross et al., 1995). Another expected finding in the patient satisfaction model is that work complexity is negatively associated with patient satisfaction. Researchers suggest that a poor work environment characterized by heavy workload and uncertain work conditions leads to lower patient satisfaction (Johansson et al., 2002; Vahey et al., 2004). Additionally, nurse education level has a negative relationship with patient satisfaction. One possible explanation could be related to nurses' affectivity regarding their jobs among BSNs. While nurses with higher education levels could better meet patients' expectations of ideal care, the interactions between patients and nurses who are less satisfied might negatively influence patients' affectivity about their perceptions of nursing care. Previous studies also found that baccalaureate nurses perform professional behaviors and more complex functions but have lower levels of job satisfaction than associate-degree (ADN) and diploma nurses (Johnson, 1988; Rose, 1988; Young et al., 1991).

*Average Length of Patient Stay*

The average length of patient stay is a measure of hospital efficiency (Clarke & Rosen, 2001; Halter, 2006; Murphy & Noetscher, 1999). To reduce hospital length of stay under the prospective payment system, reducing length of stay has been emphasized (Weingarten et al., 1998). Well-coordinated work processes are expected to produce not only higher-quality outcomes but also increased efficiency (Gittell, 2002). Researchers found that

better coordination among care providers is significantly associated with shorter lengths of patient stay (Cho et al., 2003; Halter, 2006; Shortell et al., 1994; Tschannen, 2005; Zwarenstein & Bryant, 2000). This study, however did not find a significant relationship between relational coordination with other health care providers and average length of stay. One possible explanation for this finding could be associated with omitted variables. For example, under the prospective payment system, there is pressure to discharge patients from the hospital within a constrained period of time. Patients could be readmitted if healthcare providers do not recognize all of the patients' medication conditions, such as nosocomial infections. If nursing units have a working culture that promotes better communication and coordination in caring for patients, doctors and nurses working in such units could notice patients with infections (and other risk factors for readmission) and maintain them in the hospital instead of discharging them. Still, the average length of stay in such a unit is longer than that of nursing units with lower communication and coordination. Such units may simply follow hospital policy and may be insensitive to patients' medical conditions. Although this study controlled for the health status of patients, it may insufficiently control for all other factors affecting length of stay. In terms of control variables, average length of patient stay has negative relationships with patient health status. Nursing units with healthier patients have shorter average lengths of patient stay than nursing units with sicker patients.

*Patient Falls*

The problem of patient falls is an ongoing concern to health care providers (Alcee, 2000). Among the factors associated with patient falls is decreased levels of consciousness, sometimes resulting from medications. Patient falls are considered a nursing-sensitive

outcome (American Nurses Association, 1999; Lake & Cheung, 2006; National Quality Forum, 2004). An extensive incident report found 3.73 falls per 1,000 patient days for the most common types of nursing unit (Dunton et al., 2004). This result is comparable to findings in the current study (4.03 falls per 1,000 patient days). The reason why nurses are crucial to preventing patient falls is that they potentially have the information for assessing the risks of a fall (Lake & Cheung, 2006). In addition, enhanced communication and coordination among care providers could improve early detection and intervention in managing these risks. Corser (2004) found that interdisciplinary coordination effectively reduced patient falls.

Nonetheless, the result of Hypothesis 2d did not support a relationship between coordination and patient falls. One possible explanation could be related to the measurement issue of relational coordination. Relational coordination with other health care providers includes four communication dimensions (frequent, timely, accurate, and problem-solving communication) and two relationship dimensions (shared goals and shared knowledge). Communication and shared information among nurses and other care providers can be broad. Information exchanged among providers could include anything related to patient care, such as a patient's medical condition, daily care plan, symptom change, special procedures, lab results, as well as patient fall risk. For this reason, although nurses may perceive good coordination with other health care providers, such coordination may not be of the type that is relevant to preventing patient falls.

Hypothesis H2e, which stated that workgroup learning would have a negative association with patient falls, was not supported. Workgroup learning was measured by using the scale of error-oriented climate in a workplace (Rybowiak et al., 1999), which

represents cognitive dimensions of learning, such that employees actively think about and diagnose the sources of errors. Nursing units with more positive responses to errors are eventually able to realize a reduction in adverse events (Edmondson, 1999). In such nursing units, however, nurses are more likely to admit and to report their mistakes instead of hiding them, thus creating the appearance of have higher error rates in the short term. Thus, nursing units that promote learning from errors might have seemingly high levels of patient falls due to the tendency of other units to under-report errors. Although patient falls are rather obvious incidents, they may still go unreported. In addition, another possible explanation could be related to the way workgroup learning was operationalized. Although the scale used in this study (Rybowiak et al. 1999) included several questions to measure workgroup learning as a cognitive workgroup process, focusing errors and mistakes, by using individual group members' self-reporting after the workgroup has completed workgroup learning, vital information about workgroup learning can be lost, and this self-reports of workgroup learning would not be able to capture these dynamics (Weingart, 1997). Researchers suggested objective measurement to assess workgroup learning directly (e.g., through observation) (Weingart, 1997; Kozlowski et al., 2003). Therefore, this study may not have found significant relationships between workgroup learning and patient falls.

Among control variables, teaching hospitals had a negative association with patient falls, which suggested that hospitals having better resources for providing patient care as well as having better surveillance could reduce patient falls. Previous research indicated that the reason why hospitals with more medical or dental residents had fewer patient falls can be explained by teaching hospitals, hospitals with more technological sophistication enabling lower problem rates (Hartz et al, 1989). However, what we don't know is whether a point

would be reached where too many residents would be a bad thing to prevent patient falls. Further research needs to articulate the relationship between the number of residents (teaching hospitals) per bed and patient falls. In addition, as expected, nursing units with better patient health status reported fewer incidences of patient falls.

*Medication Errors*

Hypothesis 2f, that nursing units with better relational coordination with physicians and pharmacists would have lower medication errors, was not supported. Furthermore, the direction of this relationship was positive, statistically significant. One possible explanation for this unexpected finding may be related to omitted variables. This study might not have controlled for all other factors affecting medication errors. Nursing units experiencing higher occurrences of medication errors during January and February may try to cooperate and coordinate their work procedures to reduce these unfavorable events. In such nursing units, relational coordination would be scored higher, while the occurrence of medication errors would be high until work conditions producing those errors average are fully resolved. This opposite relationship between relational coordination and medication errors seems to suggest that this study may not have completely resolved the omitted variable bias.

As noted earlier, the measurement of relational coordination with physicians and pharmacists may not be limited to error-prevention coordination patterns. Furthermore, communication styles between nurses and physicians are different from nurse-pharmacist communication. While nurse-physician relational coordination may focus primarily on factual information about general patient care while neglecting subtle concerns, nurse-pharmacist communication is likely to focus on inquiries specific to medications. Such

contrasting points of emphasis in coordination may have resulted in an insignificant relationship between relational coordination with physicians and pharmacists and medication errors. Another possible explanation involves an under-reporting bias, although this study used medication errors resulting in severe cases, which are likely to be reported. The literature has frequently noted the presence of reporting bias when investigating medication errors (Wakefield et al., 1996). This study used medication errors that required increased nursing observation, technical monitoring, laboratory and radiographic testing, medical intervention or treatment, or transfer of the patient to another unit. Such medication errors are more likely than others to be reported. Despite such efforts, the opposite relationship between relational coordination and medication error rates seems to suggest that such an approach may not have completely resolved the problem of under-reporting. Another possible explanation of this insignificant relationship is the problem of under-detection. Under-detection occurs when an error is not found or identified, while under-reporting is an intentional choice not to report an error when it happens (Kopp et al., 2006; Seki & Yamazaki, 2006). For example, if a patient experiences a medical problem induced by a medication error that no one, including the nurses who made the error and their co-workers, notices, an error has been under detected. Furthermore, nurses with more experience with medications are more likely to be aware or potential mistakes (e.g., knowledge about a drug's mechanism and side effects) which may enable them to better detect errors.

Results related to Hypothesis 2g indicated that nursing units scoring higher on workgroup learning had significantly fewer medication errors. Research has suggested that nurses and doctors can learn from their errors, especially when they are able to discuss them with their colleagues in a supportive environment (Edmondson, 1999; Meurier, 2000).

Previous research found that open and constructive responses to errors are associated with fewer incidents (Hofmann & Mark, 2006). The underlying logic is that learning from errors prevents medication errors by defending against the latent and active failures that may have occurred in the previous stage of the medication process (Reason, 1995). Nurses in a supportive environment are empowered to identify and remedy these conditions before a medication error occurs. However, not discussing or learning from errors discourages nurses from acting and allows errors to remain uncorrected. Therefore, the significant negative relationship found in this study between workgroup learning and medication errors provides empirical evidence that better workgroup learning leads to fewer occurrences of medication errors.

In the model of medication errors, nurse education levels are the only variable with a significant negative relationship with medication error rates. The underlying logic is that baccalaureate nurses (BSNs) perform more professional behaviors, such as problem solving communication and patient education, and that they might have more knowledge of medication administration (Johnson, 1988). Few studies, however, have directly examined the quality of care provided by these nurses. A current study did not find differences in the quality of care – measured medication errors and patient falls – between nursing units with more BSNs and those with fewer baccalaureate nurses (Blegen et al., 2001). Chang (2007) articulated the nurse education-medication error rates. She found that nurse education had a negative effect on medication errors until a nursing unit had 39% BSN-prepared nurses on the unit, followed by a diminishing marginal effect. On the contrary, if a nursing unit has greater than 50% of BSNs, it would minimize medication error rates by decreasing the proportion down to 40-50%. Based on this finding, she suggested 40 to 50% of BSNs may

be the optimal proportion for a nursing unit to minimize medication error. Therefore, the current study provided empirical evidence of the impact of nursing education levels on the frequency of medication errors.

**Mediating Effects of Workgroup Processes on the Relationship between Nursing Turnover and Patient Outcomes**

In Chapter 2, discussion focused on the mediating effects of workgroup processes on the turnover-outcome relationships. Processes represent mechanisms that inhibit or enable workgroup members to combine their capabilities and behaviors (Kozlowski et al., 2003). In this study, workgroup processes included affective (workgroup cohesion), behavioral (relational coordination), and cognitive (workgroup learning) mechanisms. This study suggested that negative outcomes associated with nursing unit turnover may be mediated by workgroup processes. The mediating effects of workgroup processes on the turnover-outcome relationship was tested by first assessing the effects of nursing unit turnover on patient outcomes (Tables 11 and 12), the combined effects of nursing unit turnover and workgroup processes on patient outcomes, and the effects of nursing unit turnover on workgroup processes (Table 8). To show mediation, all of these effects must be significant, and the significance of the associations between nursing turnover and patient outcomes must be reduced by adding workgroup processes to the model (Baron & Kenny, 1986).

The relationship between nursing unit turnover and patient satisfaction was hypothesized to be mediated by workgroup cohesion and relational coordination. Because the effects of nursing unit turnover on these two workgroup processes were not significant (Table 8), the mediating effects of workgroup cohesion and relational coordination on the

turnover-patient satisfaction relationship were not supported. Additionally, no significant relationship was found to exist between nursing turnover and patient satisfaction (Table 11).

Relational coordination was expected to mediate the relationship between turnover and average length of patient stay. In order to be seen as mediating effects, a significant association must exist between turnover and length of stay. However, average length of patient stay was not associated with either nursing unit turnover or relational coordination. Therefore, this study did not find a mediating effect of relational coordination on the relationship between turnover and length of stay.

Relational coordination and workgroup learning were theorized to mediate the effects of turnover on patient falls and medication errors. This study found that nursing turnover has a positive impact on preventing patient falls (Table 12). Nursing units with low levels of turnover (greater than 0 to 3.2%) are likely to have fewer patient falls than nursing units with 0% turnover. However, the findings failed to suggest that workgroup processes mediated the turnover-patient safety relationship because patient fall was not associated with either relational coordination or workgroup processes (Table 10). That is, this study did not find that lower levels of workgroup dynamics induced by high turnover rates led to a greater incidence of patient falls. Although this study found a significant effect of workgroup processes on medication errors, the mediating effects of workgroup processes were not found in the model of medication errors because nursing turnover was not related to medication errors. In addition to the aforementioned reasons regarding the insignificant relationship between workgroup processes and patient safety variables, several possible explanations could account for this insignificant turnover-patient safety relationship. As noted earlier, the first possible reason, that turnover did not perform well as a factor affecting patient safety

could be related to the measurement issue of patient safety. Again, the possibility of under-reporting (an intentional choice not to report) and under-detection (a failure to identify) may provide an explanation for these unexpected findings.

Another possible reason could be associated with the operationlization of the turnover measure. Turnover rates for the two-month period in this study were likely to be 0%, and about half the nursing units reported 0% turnover during this period. Researchers suggested that turnover should be measured over a reasonable time span, at least several months if not a full year, to be realistically annualized (McConnell, 1999). To keep the measurement order of the turnover-process-outcome, this study used turnover information for only the two-month period, which might not provide sufficient levels of turnover and enough variations in turnover rates. In turn, this study might fail to represent the overall nursing unit turnover patterns in each nursing unit. Regarding the issue of turnover measurement, another consideration might be the type of turnover measured in this study. Any type of turnover, including internal and external turnover as well as involuntary and voluntary turnover of RNs, was used in this study. The rationale for using turnover resulting from all causes is that turnover itself can affect work processes in each nursing unit, regardless of theses reason of leaving. Voluntary turnover, however, might have a different meaning than involuntary turnover to the remaining nurses in the nursing units. While voluntary turnover is usually considered to involve the loss of a valued employee, involuntary turnover, such as dismissals or layoffs, can be beneficial to nursing unit productivity. That is, when less productive employees leave, there is the potential for increased workgroup productivity. Thus, additional study is needed to more precisely measure turnover so that the effects of turnover on patient falls and medication errors can truly be evaluated.

## Theoretical Implications

Chapter 2 presented potential negative and positive aspects of turnover. Previous research showed that the consequences of turnover result from how workgroup processes among remaining employees change after experiencing the departures of coworkers (Price, 1977; Staw, 1980). As Staw (1980) noted, the outcome variables included in turnover studies could be viewed as intermediate variables, which are in turn related to end-result variables, such as patient outcomes, care efficiency, or patient safety. Most empirical research of nursing turnover assessed the direct impact of nursing turnover on patient outcomes without exploring the mechanisms by which turnover affected patient outcomes (Alexander et al., 1994; Castle & Engberg, 2005; Voluntary Hospital Association Health Foundation, 2002). Furthermore, these empirical studies used the turnover rates aggregated at the hospital level; however, this aggregated turnover rate was not sensitive to variations in workgroup mechanisms (intermediate outcomes) among nursing units. Thus, models of the consequences of turnover have not been fully developed or tested. To test the full model of the consequences of turnover, this study suggested that negative and positive impacts of turnover on workgroup processes could mediate the relationship between turnover and outcomes at the nursing unit. The motivation of the current study began with the question of whether nursing unit turnover could be associated with poor patient outcomes, and, if so, what is the nature of underlying mechanisms behind this association.

The results of this study did not support the hypotheses developed regarding the consequences of turnover on workgroup processes. With the exception of workgroup cohesion and relational coordination in the patient satisfaction model and workgroup learning in the medication error model, this study did not find a relationship between poor workgroup

processes and negative patient outcomes. Moreover, patient falls was the only outcome variable related to nursing turnover. Although possible explanations for these results were discussed, other explanations may have important theoretical implications for further development and for testing.

The proposed model was formulated around the input-process-outcome (IPO) framework posited by McGrath (1964). The fundamental assumption of the turnover-process-outcome framework was that workgroup processes were treated as an underlying mechanism affecting the impact of nursing unit turnover on patient outcomes. Additionally, potential moderators of the turnover-process relationship should be explored because situational factors and constraints in the work environment may affect the degree to which turnover produces negative outcomes. For example, as the work environment becomes more complex and uncertain, even a single person leaving a nursing unit can have a very significant impact on workgroup processes. Another possible moderating effect could be nursing unit culture corresponding to turnover. The ability of nursing units to tolerate or cope with vacancies (i.e., the magnitude of their effects) may vary across nursing units. Vacancy tolerance depends on how the staff nurses and mangers perceive the ability of nursing units to cope with vacancies (Jones, Mark, Gates, & Eck, 2005). In nursing units enabled to cope with nursing vacancies within a short period, the impact of nursing turnover will be attenuated. In contrast, if a nursing unit does not have much experience with nursing departures and a lack of tolerance to vacancy, for example, the ability of remaining nurses to take on additional patient care and adjusting to the change in the social structure of the nursing units brought on vacant positions, the magnitude of the impact of nursing turnover will be greater even when only a few nurses leave a unit. Therefore, these moderators may

provide insight into the conditions of nursing units most at risk, not only because of the impact of turnover, but also because of the severity of its impact.

Another theoretical implication of this study concerns the optimal level of turnover. In this study, the potential positive consequences of turnover were tested by identifying the presences of a nonlinear relationship between turnover and workgroup learning. At the range of annualized turnover rates from 19.2 to 27%, nursing units are likely to have higher workgroup learning than nursing units with 0% turnover. This study did not find either negative or positive impact of turnover at annualized turnover rates greater than 0 to 19.2 %. Other turnover studies argued that the loss of a valued employee is dysfunctional only if it detracts from the workgroup's overall effectiveness and that, certain levels of newcomer inflow can be beneficial to workgroup processes (Abelson & Baysinger, 1984; Dalton & Todor, 1979; Staw, 1980). Therefore, organizations most likely attempt to achieve an optimal rate of turnover, which is consistent with balancing the costs of turnover against the costs of reducing it (Abelson & Baysinger, 1984). The optimal turnover rate for different workgroups is likely to vary according to the different circumstances that influence the balance point between retention and turnover costs. As an example, consider nursing units with high levels of stress, such as intensive care units. In such units, nurses are in roles with a demanding of physical workload, requiring sophisticated nursing knowledge and skills, and needing mutual adjustment with other healthcare providers due to the highly interdependent team-oriented care (Shortell et al., 1994). The turnover rates in these units may be higher than less demanding and stressful nursing units because of nurse burnout. It implies that these units lose valued nursing staff with unit-specific knowledge and skills, which results in hindering a well-coordinated workgroup structure that enables high quality of care. The optimal turnover

rates may not be the same with the turnover rate empirically found in the intensive care unit because the cost of turnover is higher than the cost of reducing it. Therefore, it is necessary to investigate the positive and negative impacts of turnover to determine the optimal turnover rate, which may vary depending on the circumstances of the nursing unit.

This study used a lagged information approach to control the endogeneity problem in turnover. The fundamental assumption of this approach is that nursing turnover in one time period would affect work dynamics in the following month. This study did not consider any contemporaneous impacts of turnover. The contemporaneous impacts of turnover mean impacts of existing or occurring during the same time when turnover occurs. Although the lagged information approach could support a causal effect of turnover on workgroup processes and patient outcomes better than a cross sectional study, this causal relationship would be weakened by any missing variables. The contemporaneous impact of turnover could be one such missing variable. As an example, consider the turnover-workgroup cohesion relationship. If turnover has a contemporaneous impact on workgroup cohesion, information about workgroup cohesion should be measured at the month the turnover rate was measured. In other words, that is, when nurses leave a nursing unit, nursing turnover undermines individual members' attraction to nursing unit during the same time. This study, however, measured turnover rates prior to measuring work group cohesion so that the estimate of turnover in the workgroup cohesion model might be biased if turnover has a contemporaneous impact on workgroup cohesion. Therefore, further investigation is needed to explore the lagged impact of turnover as well as the contemporaneous impact of turnover.

The final theoretical implication relates to the application of the theoretical framework developed in this study to other types of nursing units or to different healthcare

organizations. Each workgroup process and patient outcome examined may have implications to medical-surgical nursing units, but these implications might not be applicable to other nursing units. Patient characteristics and nursing care differ among different types of nursing units, and, as a result, the consequences of turnover may also be different. For example, hospital emergency units face much uncertainty in the course of their work (Argote, 1982). It is uncertain about what is wrong with particular patients and about appropriate treatment methods. Also the overall composition of patient inputs, such as the number of patients with various conditions, is not easily predicted. As the number of frequently observed patient conditions increases, the unit is required to develop an elaborate procedure for care with pre-specified responses to deal with the increased number of frequently observed conditions. Individual nurses are required to learn how to identify a great number of conditions, a large set of pre-specified responses, and how and when to apply them. The spontaneous forms of coordination involving on-the-spot sharing of information among nursing staff are an effective way of limiting the increased demands associated with increased uncertainty in hospital emergency units. In other words, certain nursing units deal with a less-routine patient population, thereby requiring greater coordination. Furthermore, such units usually have unit-specific highly qualified nurses while, at the same time, patient care requires well-organized workgroup processes. Thus, a loss of nursing staff would have a great impact on patient care. For this reason, further research should be explored in various settings before one could reach solid conclusions about the consequences of turnover.

## Policy Implications

The most important finding of this study from a workforce policy perspective is

indirect costs of nursing turnover, researchers pointed out that indirect costs of nursing turnover are significant because of the decreased initial productivity of new employees and the decreased in staff morale and group productivity (Johnson and Buelow, 2003, Jones, 2008). Waldman (2004) indicated that the models of turnover costs have typically omitted the costs associated with the lower productivity of new hires. The Advisory Board Company (2000) suggests that the hidden costs of lost productivity are 79% of salary. Similarly, O'Brien-Pallas et al. (2006) found $15,069 for indirect costs as a result of both the time spent administering turnover process and the costs associated with orientation, training, and lower productivity of new employees. In addition to indirect costs discussed previous turnover research, the findings in this study suggests deteriorated workgroup learning as indirect costs of turnover. Decreased workgroup learning are the productivity loss in the nursing unit resulted from increased nursing turnover, which need to be considered to assess indirect costs of turnover. These indirect costs of nursing turnover would help to find the costs associated with nursing turnover, which in turn, enables to find an optimal rate of turnover consisted of balancing the costs of turnover against the costs of reducing it. Therefore, the findings of the current study provide decision makers with more specific information on the operational impact of turnover.

Another policy implication from this study is related to the unexpected relationship between turnover and quality of patient care. Although this study did not find a significant association between these two variables, these results should be viewed cautiously. Castle and Engberg (2005) studied the impact of staff turnover on quality of care in nursing homes and found for RNs, a negative relationship between turnover and quality for all 6 quality indicators (use of physical restraints, catheter use, contractures, pressure ulcers, psychoactive

drug use, and deficiency citations). Differences between the current study and Castle and Engberg's study (2005) could explain the insignificant turnover-quality relationships in this study. Castle and Engberg (2005) used annualized staff turnover data obtained by the American Health Care Association one year prior to measuring the quality indicators. As noted earlier, this study used turnover rates for a two-month period, which might not reflect overall turnover patterns in each nursing unit. In addition, Castle and Engbers' study used such indicators of quality as the rates of physical restraint use, catheter use, contracture, pressure ulcers, psychoactive drug use, and certification survey quality of care deficiencies. These quality indicators represent various aspects of nursing care in long-term care settings. In comparison to their study, the current study used limited patient outcomes in acute care settings. Including nurse sensitive quality indicators such as nosocomial infection and failure to rescue other than those used in this study may help to find the impact of turnover on patient quality of care. For this reason, this study did not find a negative relationship between turnover and patient quality. Therefore, before reaching firm conclusions, further research needs to examine the true impact of turnover on quality of care.

## Practice Implications

Chapter 2 summarized research from several disciplines to better understand turnover behavior and impacts. While the prime focus of turnover research has been to elaborate the antecedents of turnover, few studies have focused specifically on the consequences of turnover (Glebbeek & Bax, 2004). Although we have an implicit sense that turnover is associated with poorer outcomes, few investigations have explored this relationship. This study provides insight into the dynamics of the turnover-outcome relationship. At the same

time, the results of this study suggest that nurse administrators must understand the underlying mechanisms (workgroup processes) of the turnover-outcome relationship. Nurse administrators might use this information to form nurse staffing strategies. For example, at turnover rates greater than 3.2% to 4.5%, workgroup learning is negatively affected by nursing turnover compared to 0% turnover. Consider a nursing unit with 25 RNs. In such a unit, the departure of one staff nurse (4% of 25 RNs) in a two-month period would damage workgroup learning in that unit, compared to a nursing unit with 0%. Nurse administrators could minimize the negative impact of turnover by understanding the various threshold points where additional increases in turnover may lead to negative outcomes. Additionally, nurse administrators need to know the particular work conditions that may minimize the negative impact of turnover on workgroup processes (e.g., the ability of nursing units to tolerate or cope with vacancies).

The findings that nursing units with low levels of turnover (greater than 0 to 3.2%) may experience decreased patient falls can also be helpful to nurse administrators as they seek to take advantage of the positive impacts of turnover, although this study did not find the underlying mechanisms of this relationship. As discussed earlier, turnover may infuse new blood in to an organization, introduce fresh ideas, and keep the organization from becoming stagnant (Dalton & Todor, 1979). This study specifically identified a positive impact of turnover on the occurrence of patient falls. Nursing units with low levels of turnover are likely to have fewer patient falls than nursing units with 0% turnover. It suggests that a certain level of turnover is necessary to prevent patient falls. Therefore, nurse administrators need to aware that the prevention of patient falls might not be established in nursing units having too much stability such as 0% turnover.

The study findings also support the need to develop workgroup cohesion and coordination to improve patient satisfaction. As reviewed earlier, patient satisfaction is the degree of convergence between patient's expectation of ideal care and their perception of the care that they actually receive (Risser, 1975). Greater cohesion among employees strengthens employee motivation to provide excellent service, in turn lead to higher levels of patient satisfaction (Meterko, Mohr &Young, 2004). Furthermore, in high cohesive workgroups, less energy is required to maintain within-workgroup relationships, and more energy can devoted toward workgroup performance (Deeter-Schemlz &Kennedy, 2003). In such a nursing unit, this energy devoting workgroup performance will improve quality of care, which in turn, leads to higher levels of patient satisfaction. In terms of relational coordination as a spontaneous form of coordination, a culture emphasizing effective coordination among healthcare providers was positively associated with quality of care (Shortell et al., 1994). In nursing units with higher task interdependences, employees need strong relationships and effective coordination to increase their readiness to patient care. Gittell et al. (2000) found improved patient satisfaction being associated with higher levels of relational coordination among care providers. The results of current study confirmed this positive effect of workgroup cohesion and relational coordination on patient satisfaction. This finding suggests that by developing and sustaining highly cohesive and well coordinated nursing units, quality of care will be improved. Nursing managers need to be aware and promote workgroup cohesion and coordination among nurses.

Similarly, this study found that nursing units scoring higher on workgroup learning had lower medication error rates. As reviewed previously, supportive environments allowing open and constructive responses to errors help nurses and doctors learn from their errors,

especially when they are able to discuss them with their colleagues (Edmondson, 1999; Meurier, 2000; Hofmann & Mark, 2006). Nurses in a supportive environment where they learn from their errors are empowered to identify and remedy these conditions before a medication error occurs. However, not discussing or learning from errors discourages nurses from acting and allows errors to remain uncorrected. Therefore, the results of the current study confirmed this positive impact of workgroup learning on the prevention of medication errors. This finding suggests that, by developing and sustaining nursing units that actively learn from errors, medication errors will be reduced. Nursing managers need to be aware of and promote workgroup learning among nurses.

On a practical level, findings on this study may contribute to management's ability to decide about human resources utilization can be made. Important managerial considerations are the costs associated with various turnover rates relative to those associated with different strategies for reducing turnover. Therefore, results of the current investigation provide decision makers with more specific information on the operational impact of turnover so as to better design, fund, and implement appropriate intervention strategies to prevent RN exit from nursing units.

## Limitations

This study, like others, has several limitations. The first relates to measurement of turnover. To control the endogeneity problem of turnover, this study used a lagged information approach. Turnover rates for a two-month period were used, and this study did not consider nursing turnover after the two-month period. Because the ORNA II study was designed as a non-experimental causal modeling study, nursing units might have additional

nursing turnover after the two-month study period. For example, consider a nursing unit with 4% turnover for January and February and 10% turnover from March to June while another nursing unit had 4% for January and February and 0% turnover during March to June. In this study, both nursing units were treated as having turnover rates of four percent. This study assessed the impact of 4% turnover on workgroup processes and patient outcomes. The findings could, however, be compromised by a possible contemporaneous impact of turnover on workgroup processes and patient outcomes. Therefore, in addition to a lagged impact of turnover, future research needs to consider a potential contemporaneous impact of turnover.

The study design presents another study limitation. As noted earlier, the ORNA II study was designed as a non-experimental causal modeling study. Data were collected longitudinally with a temporal order of certain variables, but data were not collected for all variables at each collection point. By not collecting data for every variable at each time period, this study had to assume that control variables consistently influenced process and outcome variables over the study's time periods. The problem with this assumption is that changes in control variables over this six-month study period may also affect process and outcome variables. For example, in the workgroup process models, work complexity, nurse characteristics (nurse education and unit tenure), and hospital characteristics (hospital size, technological sophistication and teaching hospitals) were used as control variables. While hospital characteristics rarely change, work complexity and nurse characteristics may change over a six month period. This study did not account for potential changes over time, which could lead to omitted variable bias.

A third limitation of this study relates to risk adjustment. This study used several variables to risk-adjust patient health status. First, a patient's age, health status, and previous

hospitalizations can reflect patient acuity. Second, work complexity can function as a risk adjustment variable because it measures the presence of environmental uncertainty mostly related to patient condition. Third, by collecting data from general medical-surgical or medical-surgical specialty units, the ORNA II study controlled for patient type. Despite these approaches, patient risk may not have been sufficiently adjusted so that nursing units may have lower patient satisfaction, longer length of stay, higher patient falls, and medication errors due to having clinically severe patients. In addition to patient age, subjective health status, and previous hospitalizations, a more precise measure of patient medical acuity might be employed, such as medical diagnosis and a unit-based patient classification system. These approaches might better control for severity of patient condition (Seago et al., 2006).

A final limitation of this study is associated with omitted variables. This study relies on secondary data analysis. When conducting a secondary analysis, data are limited by the variables collected in the original study. Therefore, possible confounding variables may not have been included in the study. In Chapter 2, as noted, models of nursing turnover have characterized turnover as a function of job satisfaction affected by organizational factors, demographics, environmental conditions, and professional and personal issues (Hinshaw & Atwood, 1983; Irvine & Evans, 1995; Price & Mueller, 1981). Obviously, other determinants of turnover could affect workgroup processes and patient outcomes. For example, leadership that values the contribution of staff nurses promotes retention, and a participative management style enhances job satisfaction (Bratt et al., 2000; Jones et al., 1993; Yeatts & Seward, 2000). Such leadership and management style factors might also positively affect relational coordination because nurses under such leadership could

participate more in patient care and communicate better. Excluding these factors in the model could lead to a negative bias. Because the beta coefficient of turnover on relational coordination is negative ( $\beta$ = -0.003), the negative bias can be interpreted to mean that the true effect of turnover is less than the coefficient estimated. In turn, the relational coordination model might overestimate the negative impact of turnover. Therefore, the inability of this study to control omitted variables should be viewed as a limitation.

## Future Research

Despite potential improvements over previous research on nursing turnover, further methodological improvements could be made in future studies by employing a longitudinal design. Among the most important contributions of the current study is the exploration of the impact of turnover on patient outcomes and the mechanisms underlying the turnover-outcome relationship. The nonlinear relationship between turnover and group learning suggested negative consequences of turnover. Furthermore, the turnover-patient fall relationship suggested a possible positive effect of turnover. Nonetheless, the precise roles played by each construct are less clear because this study is an early exploration of the turnover-process-outcome relationship. For example, this study did not find any mediating effects of workgroup processes on the turnover-outcome relationships, although workgroup cohesion and relational coordination variables were positively related to patient satisfaction. This study did not find a mediating effect of workgroup cohesion and relational coordination on the turnover-patient satisfaction relationship because turnover did not have a direct effect on patient satisfaction. Additionally, post-hoc analysis showed that turnover for the six-month study period (January to June) was negatively related to patient satisfaction. While

such turnover consequences can be examined by using a longitudinal study, one must know over what period of time nursing turnover is likely to result in decreased workgroup processes and, consequently decreased patient outcomes. Further research on turnover consequences that employs a longitudinal design should be able to explore further the mediating of workgroup processes.

While the theoretical framework developed in this study was used to explore the consequences of nursing unit turnover, it may or may not be useful as the theoretical grounding in the investigation of other types of turnover, such as the consequences of nursing turnover at the organizational level and on different types of healthcare professionals. This study used the nursing unit as the unit of analysis to explore the mechanisms underlying the turnover-outcome relationships because the nursing unit provides a proximal context for the effects of turnover. Organizational-level consequences of nursing turnover, however, could be related to larger organizational processes, such as inter-departmental relations and investment in training and development. In turn, nursing turnover at the organizational-level may affect organizational performance. Therefore, an investigation of different levels of consequences of nursing turnover needs to develop a theoretical framework to assess the relationship between turnover and organizational performance. Furthermore, it is also not known if the framework will be applicable to turnover among other professional groups. In fact, turnover studies have examined several types of nurse staff turnover among nurses other than RNs, including nurse aides and licensed practical nurses (Castle & Engberg, 2005), implicitly assuming that all departures identically affect workgroup processes. Depending on the degree to which turnover contributes to workgroup processes and to patient outcomes, however, the consequences of turnover induced by each departure might vary. Future

research needs to consider how turnover affects workgroup processes and outcomes for different types of nurses. Studies could use the weighted impacts of turnover by incorporating the different contributions to particular outcomes made by different types of nurses. Therefore, investigating how turnover consequences are different for various types of healthcare professionals is a useful avenue for research.

In conclusion, the nursing shortages across the United States will continue to grow over the coming years. As a result, the current instability in the nursing workforce implies adverse impacts on the continuity and quality of patient care. Research to examine and to better articulate the processes and outcomes associated with nursing turnover will be crucial if healthcare organizations are to meet these challenges under shortage conditions. Currently, frontline managers face a difficult challenge: they must understand and overcome the negative impacts that nursing turnover has on various workgroup dynamics and patient outcomes, and they must also appreciate the benefits that turnover may bring to the workgroup processes. The results found in this study should encourage further research focused on how nursing unit turnover affects workgroup processes and patient outcomes. Therefore, future work related to the impacts of nursing turnover on various outcomes may provide frontline nurse managers with both theoretical and practical information needed to address the challenges of turnover.

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